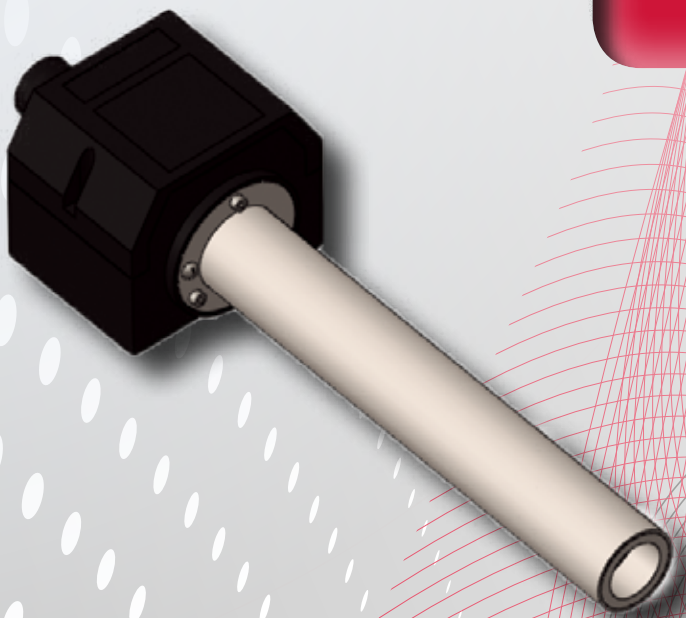
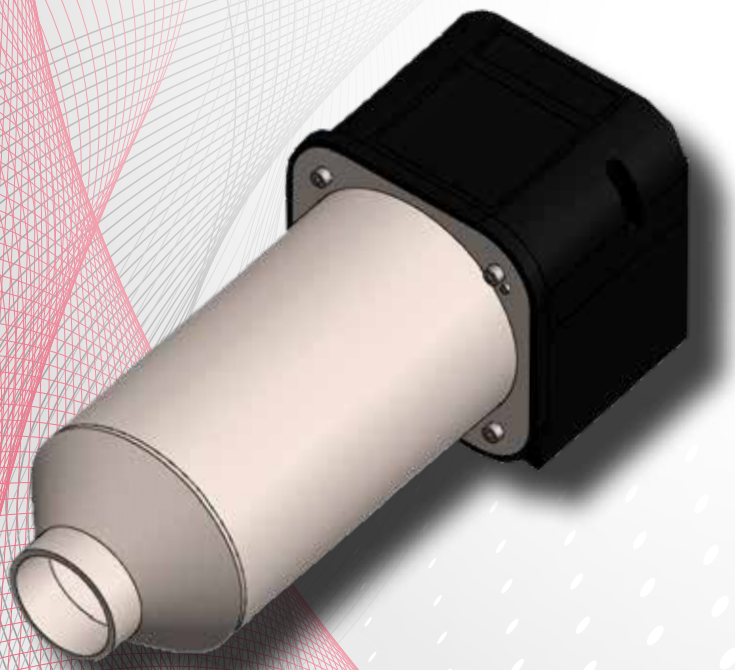
TUTCO HEATING SOLUTIONS GROUP

SureHeat

Industrial Air Heater Product Guide





www.tutcosureheat.com

Contents

Process Heat Products

Serpentine™

Tutco SureHeat understands industrial facilities are dependent upon productivity, safety, and efficiency. Every component, machine, and process impacts operational cost. In today's industrial environments, meeting productivity goals can mean the difference between success and failure. As the need for higher temperatures has increased so has productivity demands. This is a problem for most air heaters. Reaching and maintaining temperatures quickly can result in dramatically reduced heater component life. The Tutco SureHeat process heat engineering team developed the innovative Serpentine™ heating element to exceed the demands and overcome the challenge. Its manufacturing processes ensure better heat transfer, faster, and higher temperatures and a longer heating element life unmatched in the marketplace.

Tutco SureHeat electric air heaters are proudly engineered and manufactured in the USA. With over 200 variations of catalog products available, Tutco SureHeat products are used in aerospace, automotive, industrial, electronic, food, medical, packaging, plastic, pharmaceutical, printing, and numerous other applications throughout the world.

Applications

Tutco SureHeat has developed hundreds of specialty products for the most demanding applications. With air temperatures quickly and accurately controllable to 1652°F (900°C), our air heaters are perfect solutions for critical industrial hot-air processes.

Aerospace
- Combustion
- Valve / Flow Simulation
- Component Testing
- Maintenance Repair & Overhaul

Automotive
- Bonding Body Panels
- Curing Adhesives
- Vacuum Forming
- Testing and Simulation

Electronics
- Wave Soldering Air Knife
- Soldering / De-soldering
- PCB Drying Processes

Packaging
- Sealing / Curing
- Heat-shrinking
- Forming

Medical
- Pharmaceutical Manufacturing
- Packaging Processes
- Medical Hardware Sterilization

Plastics
- Salt Removal From Rubber Extrusions
- Bending / Forming of Parts
- Bonding Molded Parts

Textiles
- Welding plastic or vinyl fabrics
- Heat-treating specialty fabrics

Paper Printing
- Speed drying coated paper
- Adhesive activation and curing
- Ink drying

Air Sources

To ensure longer heater life and safe operation, it is recommended that all guidelines are followed. Please read and understand the heater operating manual before use. Failure to follow guidelines can result in heater damage, failure or personal injury.

Only use air or inert gases with electric air heaters. Never use volatile or combustible gases. Compressed air or regenerative blowers are required to supply air flow and prevent failure of the heater element. The air source should be clean and dry. Dirt, grease, oil, oil vapors and corrosive or reactive gases will damage the heater.

Regenerative Blowers

Regenerative blowers are compact and inexpensive clean air sources. They can provide large amounts of low-pressure air for heating applications. Blower size is based on the maximum amount of airflow (CFM or LPM) it can produce without any inlet or exit restrictions. When a heater or other restriction is attached to a blower, the flow decreases. If the blower is severely restricted, the blower motor can overheat and fail. When designing your heating system, try to minimize air restrictions and select a blower sufficient to overcome the back-pressure generated by the heater, flare nozzle and associated piping. Smaller diameter heaters such as the Series I, II, III, Hot Air Tool, Serpentine II, and smaller diameter threaded inlines should not be used with regenerative blowers.

Compressed Air

Compressed air is commonly available in most factories. It is high-pressure regulated air (typically to 100 psi), and often contains oil for lubricating pneumatic valves and equipment. Oil must be filtered to prevent fouling and damage to the electric air heater elements. When measuring compressed airflow rates, be sure you are measuring Standard CFM or Standard LPM units. “Standard” means that the units are at standard temperature and pressure. Many flow meters are labeled SCFM, but this is actually incorrect at the high pressures produced by air compressors. For accurate flow measurements, consult your flow meter manual for converting CFM to “Standard” CFM. In the diagram below, the flow meter reading is converted to SCFM using Dwyer ball-type flow meter conversion instructions.

Air Source | **Pressure Gauge** | **Air Flow Meter** | **Air Heater**

Steps to Selecting an Air Heater

An electric air heater works by transferring electrical energy into a passing air stream. The power and amount of air flow needed determine how hot the air heater will get.

Step 1:
Determine Standard Flow-rate (SCFM)

$$SCFM = CFM \times \sqrt{(P + 14.7) / 14.7}$$

Step 2:
Calculate Power Requirement (kW)

$$kW = SCFM \times (Exit\ Temp - Inlet\ Temp) / 2500$$

or

$$kW = SCFM \times (Exit\ Temp - Inlet\ Temp) / 3000 \times 1.2$$

Step 3:
Check Performance Curve

Step 4:
Determine Heater Pressure Rating

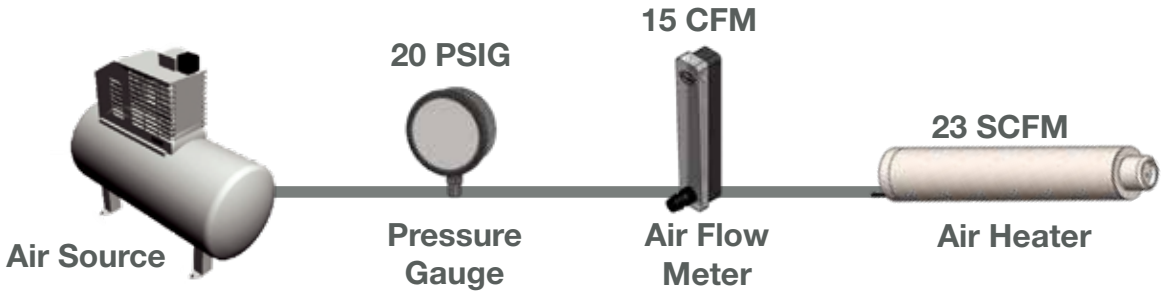
Step 5:
Other Considerations

- Supply Voltage
- Physical Size
- Mechanical Connections

ACFM = Flow Rate (Cubic Feet / Minute) at Actual Conditions
P = Pressure
T= Exit Temp = Desired Temperature (°F)
kW = Power
SCFM = Flow Rate (Cubic Feet / Minute) at Standard Temperature and Pressure
Inlet Temp = Inlet Temperature (typically 70°F)
2500 = Unit Conversion Factor (20% Heat Loss)

Tutco SureHeat offers an air heater calculator and product recommendation tool online. This simple tool calculates and converts commonly used data to help determine the correct air heater products based on calculated results. Check it out on our website at www.tutcosureheat.com.

Air Heater Calculation Examples

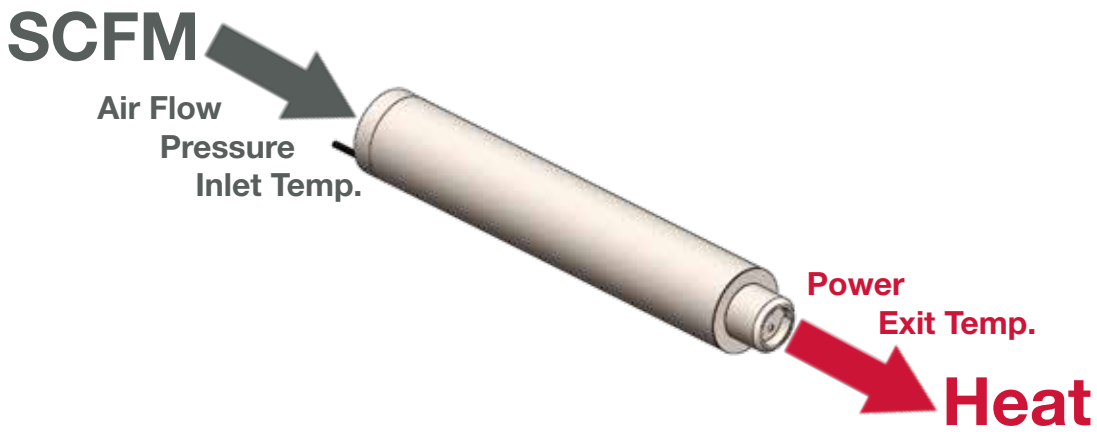


Use the above information to calculate SCFM.

$$SCFM = 15 \times \sqrt{(20 + 14.7) / 14.7}$$

$$SCFM = 15 \times \sqrt{2.36}$$

$$SCFM = 15 \times 1.54 = \underline{23}$$



To calculate power requirements; use the above example and desired exit temperature of 800°F.

$$kW = 23 \times (800°F - 70°F) / 2500 = \underline{6.72kW}$$

Recommended Heater Controls

Heater control systems are critical for proper heater set-up and longer element life. Before turning the power on to any heater, it is essential to have the proper air flow through the heater. Only qualified professionals should install electric air heaters and controllers. Follow all applicable electrical codes and recommended wiring.

Open-Loop (Manual) Control

This simple method of control uses a manually operated power controller to apply a fixed voltage to the heating element. Using this system, the operator manually adjusts the controller to change heater temperature. If the airflow is suddenly interrupted, the element could fail. This is a common and inexpensive controller and often used with simple single phase standard catalog products.

Closed-Loop (Feedback) Control

Closed-loop heater control systems use a power controller, temperature controller and thermocouple to monitor and provide a constant output temperature, regardless of changes in airflow. The typical temperature controller provides a convenient display of the air temperature. (not the element temperature)

Power Controller

SCR (Silicon Controlled Rectifier) power controls will provide the smoothest power regulation for electric air heaters. Please contact Tutco SureHeat before using other power controllers, such as SSR (Solid State Relays) or other fast-switching controllers.

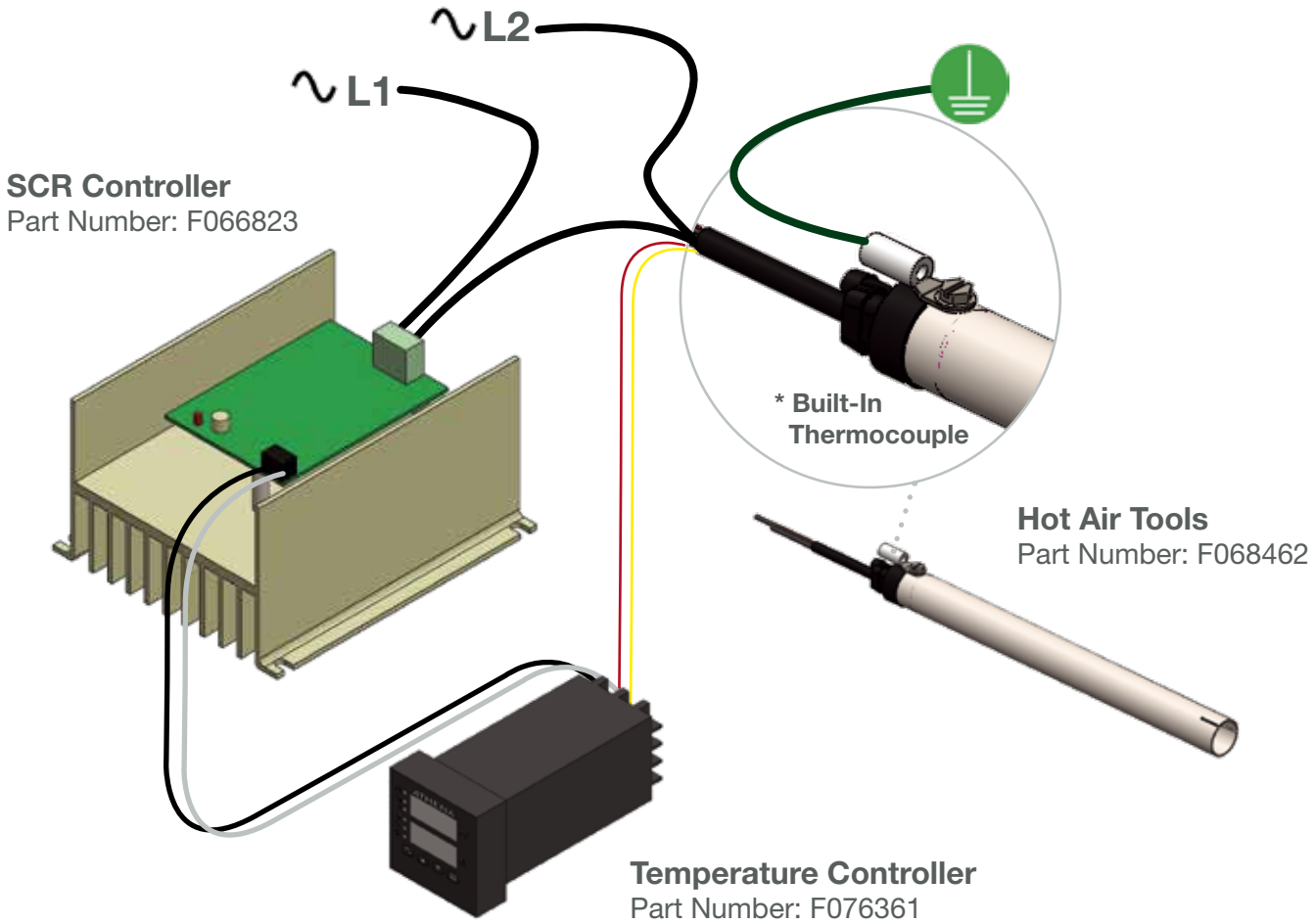
Temperature Controller

Use only digital temperature controls with Type K thermocouple inputs. The temperature control output must match the input of the power control (i.e., 4-20mA or 0-10VDC). A standard PID-type control with a wide proportional band setting will work best to minimize temperature overshoot. PID parameters may be auto-tuned, but only at temperature specifications below the maximum of the heater. Monitor the heater temperature rise and turn power off immediately if it rises above the heater specification during the auto-tune cycle.

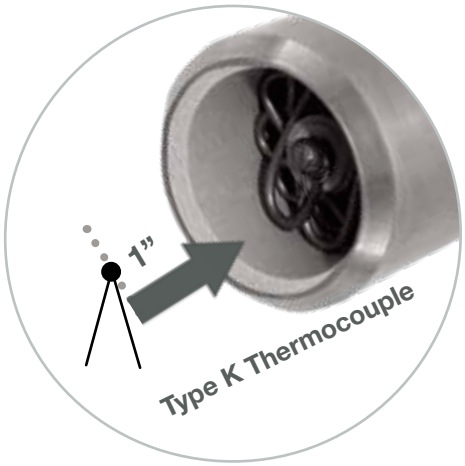
Thermocouple

Use only a fine wire (0.030” max. wire diameter), exposed junction, Type K thermocouple placed within 1” of the heater exit for accurate temperature readings. Other thermocouple styles, or varying the distance from the heater exit, will result in temperature measurement errors and thus the potential for heater failure.

Heater Control Connection Examples:

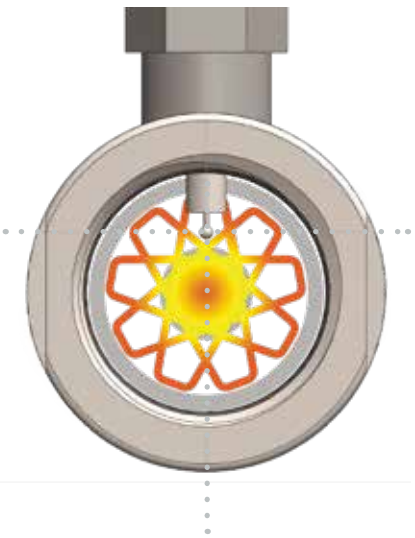


Thermocouple Placement



TC placement is very important. The exposed TC junction should be no further than 1” from the Serpentine element (Left).

Take precaution to have the exposed element slightly above the center of the ceramic tube (Right).

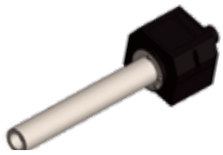


Heater Controls

Product Picture	Part Number	Description
	F057081	– Single phase voltage regulator – 0-10 scale potentiometer – Open-loop (manual) power control – **Input: 120-277VAC, 50/60Hz, 25A** – Output: 17-99% of input voltage – UL recognized
	F066823	– Phase-angled SCR power controller – Regulate air heaters up to 6000W – **Inputs: 120/240VAC, 50/60Hz, 30A, and 4-20mADC** – Large Aluminum heat-sink for cooling – For use with digital temperature controller F076361
	F072808	– 2 zone temp switch for SSR or SCR power controllers – Reduces DC signal between temp controller and power controller – Adjustable set points 300°F (149°C) and 1405°F (763°C) – **Input: 120VAC, 50 / 60Hz, 1Ø** – UL recognized, CE
	F076361	– 1/16 DIN sized temperature controller – NEMA 4X front panel (IP65) – Type K Thermocouple input – **Input: 120/240VAC, 50/60Hz, 1ø** – Output: 0-20mA for use with SCR power controllers – Relay alarm for heater element safety – UL recognized, CSA, CE
	F074835	– Analog safety switch for SureHeat® Jet and Max heaters – Switch interrupts main temp control – Adjustable set point 300-1405°F – **Input: 120-240VAC, 50/60Hz** – UL recognized, CSA, CE
	F075526	– Use with F074718 / F074719 / F074723 / F074727 – NEMA 4X enclosure – **Input: 240V, 50/60Hz, 40A** – Includes: Digital temperature controller, Inlet limit controller, SSR power controller, Circuit breaker, Power-ON indicator – RS-232 Serial Communication – UL recognized, CE

Product Picture	Part Numbers	Description
Control Panels	F076753	– Use with F074724 / F074728 – **240V / 30A / 3ø / 60Hz** – NEMA 12 painted steel enclosure – 20”H x 20”W x 10”D (508 x 508 x 254) – UL508 approved panel
	F076905	– Use with F074725 / F074729 / F077082 – **380/400V / 30A / 3ø / 50-60Hz** – NEMA 12 painted steel enclosure – 20”H x 20”W x 10”D (508 x 508 x 254) – UL508 approved panel
	F076754	– Use with F074726 / F074734 / F074731 / F077083 – **480V / 30A / 3ø / 60Hz** – NEMA 12 painted steel enclosure – 20”H x 20”W x 10”D (508x508x254) – UL508 approved panel
All Max & Max HT Control Panel have the following components — Solid state power controller SSR type — 1/16 Din PID temp controller — ON/OFF switch — Power ON LED — Emergency stop — Reset button — 3-Pole circuit breaker with door mounted operating handle — RS485 comm port — High limit temp controller for low airflow	F076755	– Use with F074732 / F077081 **– 240V / 60A / 3ø / 60Hz** – NEMA 12 painted steel enclosure – 24”H x 24”W x 10”D (610 x 610 x 254) – UL508 approved panel
	F076906	– Use with F074735 / F077084 **– 380/400V / 60A / 3ø / 50-60Hz** – NEMA 12 painted steel enclosure – 24”H x 24”W x 10”D (610 x 610 x 254) – UL508 approved panel
	F076756	– Use with F074736 / F077085 **– 480V / 60A / 3ø / 60Hz** – NEMA 12 painted steel enclosure – 24”H x 24”W x 10”D (610 x 610 x 254) – UL508 approved panel

Air Heater Products

Product	Description	Power (kW)
Series I,II,III 	– Inexpensive Spot-Heating Applications – Quartz Insulator Tube – Open or Nozzle End – Single phase	0.6 - 2.4
Hot Air Tools 	– Compact Size – Built-in Type K Thermocouple – Precise Temp Control +/- 1°F – Single phase	1.5 - 3.5
Serpentine II, VI 	– Triple Pass Exchanger – mproved Safety & Efficiency – Easy to Service & Replace Element – Single phase	2.0 - 8.0
Threaded Inline 	– High-Pressure Applications – Optional Power Connections – Critical High-Heat Processes – Single or 3 phase	1.6 - 24.0
Jet 	– All-Purpose Single Phase Heater – (2) Built-in Type K Thermocouples – Built-in Over-temp Protection – Single phase	3.0 - 8.0
Max 	– All-Purpose Three Phase Heater – (2) Built-in Type K Thermocouples – Built-in Over-temp Protection – Single or 3 phase	6.0 - 36.0
Max HT 	– High Temperature Applications – (2) Built-in Type K Thermocouples – Built-in Over-temp Protection – 3 phase	18 - 36.0

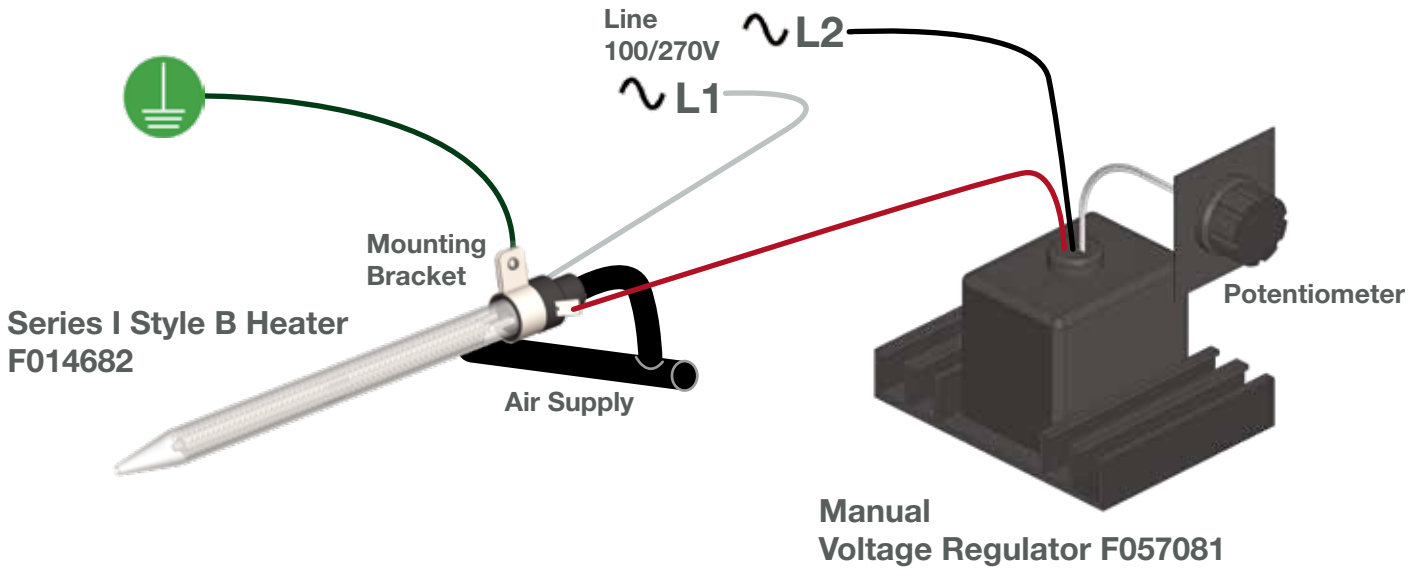
Max. Air Temperature °F (°C)	Max. Air Pressure psi (bar)	Use with Blower?
1600 (871)	7 (0.5)	No
1400 (760)	60 (4.0)	No
1500 (815)	25 (1.7)	No
1400 (760)	150 (10.0)	No
1400 (760)	60 (4.0)	Yes
1400 (760)	60 (4.0)	Yes
1652 (900)	60 (4.0)	Yes

Series I, II, III Air Heaters

General Description

Series heaters are general purpose compact electric air heaters using Serpentine™ wire heating elements within a Quartz open-end (Style A) or nozzle (Style B) for spot-heating applications. The Series products are typically powered by open-loop (manual) power controllers. The air inlet is a high-temperature silicone rubber adapter with male spade power connectors and a ground. Mounting in existing or new equipment is made easy by the included bracket.

Open-Loop Connection Diagram



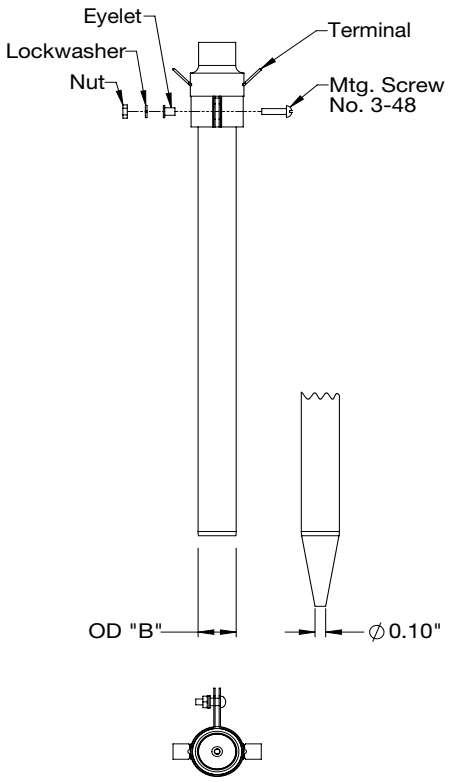
Minimizing Series Element Failures

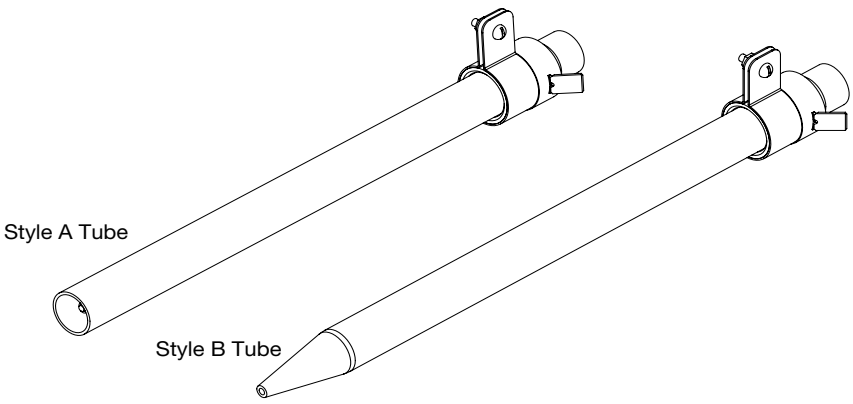
- Always ensure air is flowing before powering the heating element
- Slowly regulate the ramp up time using the potentiometer to control AC voltage

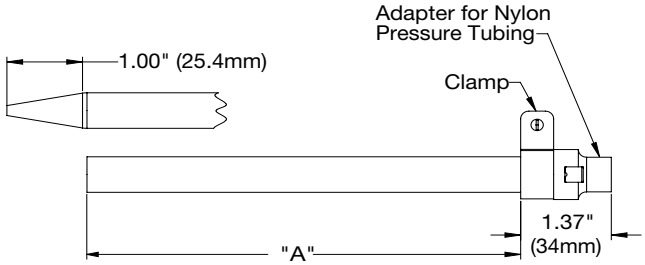
Series I	Series II	Series III
– Small diameter – Long Quartz tube – Max. 1400°F – Up to 300 SCFH @ 1000°F	– Same diameter as Series I – Smaller Quartz tube length – Nominal line voltages – 60V at Max. 1200°F – 300 SCFH @ 1000°F	– Larger diameter – Temperatures to 1600°F – Delivers up to 600 SCFH @ 825°F

Stainless Steel Outer Shields – Style A Open-Ended	
F015509	Series I P/N F014372
	Series I P/N F010226
	Series II P/N F016501, F016503

Dimensions / Installation Reference







Part Number	Style	Max. Watt	Max. Volts	Max. Amps	Length "A"	Diameter"B"
Series I						
F010226	A	1050W	180V	5.83A	6.88"(175mm)	.41" (10mm)
F014372	A	1000W	130V	7.69A	7.75" (197mm)	.41" (10mm)
F014682	B	680W	145V	4.69A	7.88" (200mm)	.41" (10mm)
F014683	B	650W	105V	6.19A	8.75" (222mm)	.41" (10mm)
Series II						
F016501	A	1125W	130V	8.65A	3.88" (98mm)	.41" (10mm)
F016503	A	850W	80V	10.62A	3.88" (98mm)	.41" (10mm)
F016502	B	600W	95V	6.32A	4.88" (124mm)	.41" (10mm)
F016504	B	650W	70V	9.29A	4.88" (124mm)	.41" (10mm)
Series III						
F017558	A	2050W	160V	12.81A	6.88" (175mm)	.59" (15mm)
F017575	B	1450W	135V	10.74A	7.88" (200mm)	.59" (15mm)

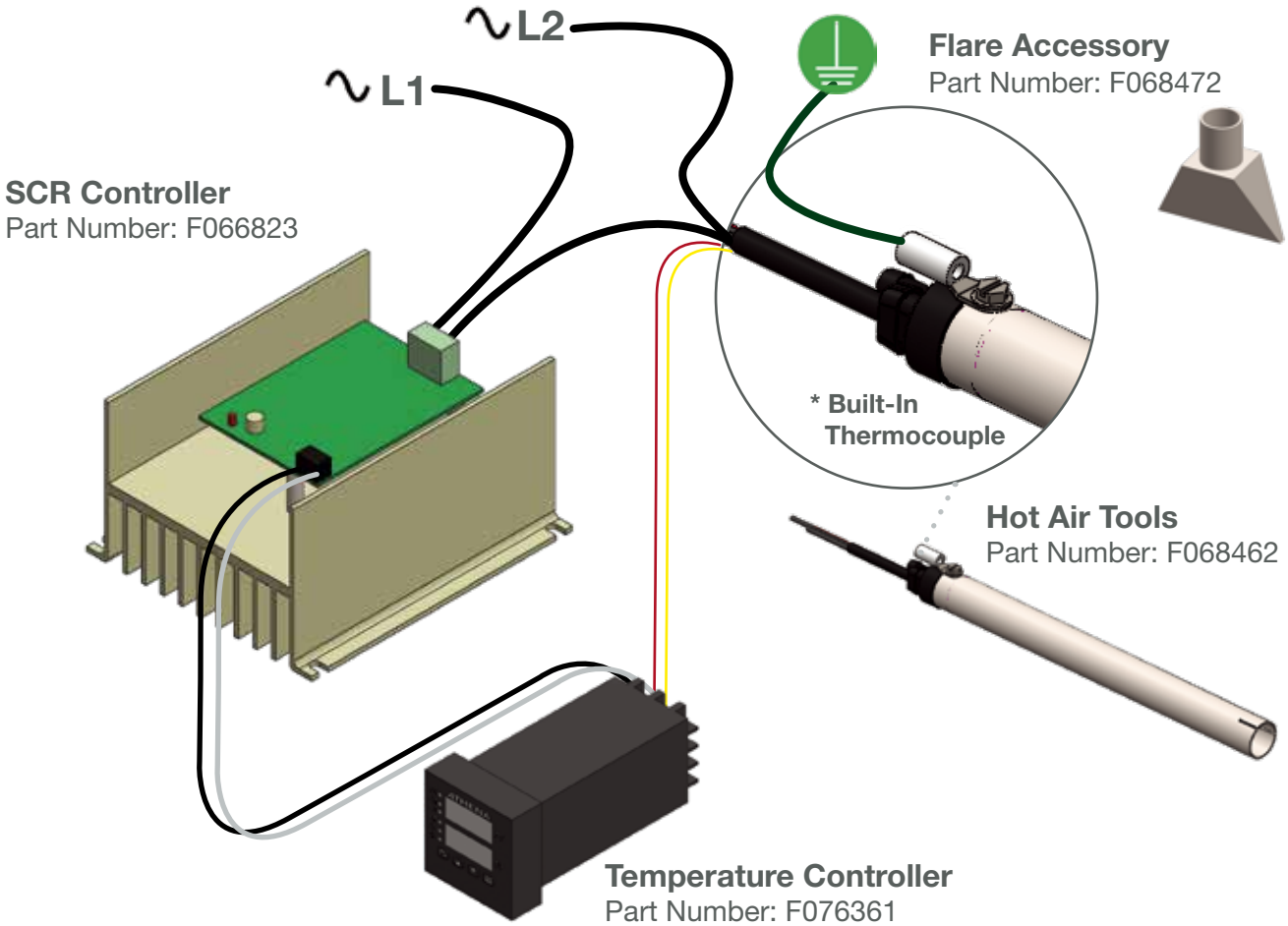
CE RoHS

Hot Air Tools

General Description

Hot Air Tools are multi-purpose electric heaters with a built-in thermocouple for precise temperature control. The compact size makes this product perfect for single phase OEM applications. Its 304 stainless steel body construction is slotted for flared accessories and is made to withstand pressures up to 60 psi (4 bar) and temperatures up to 1400°F (760°C)

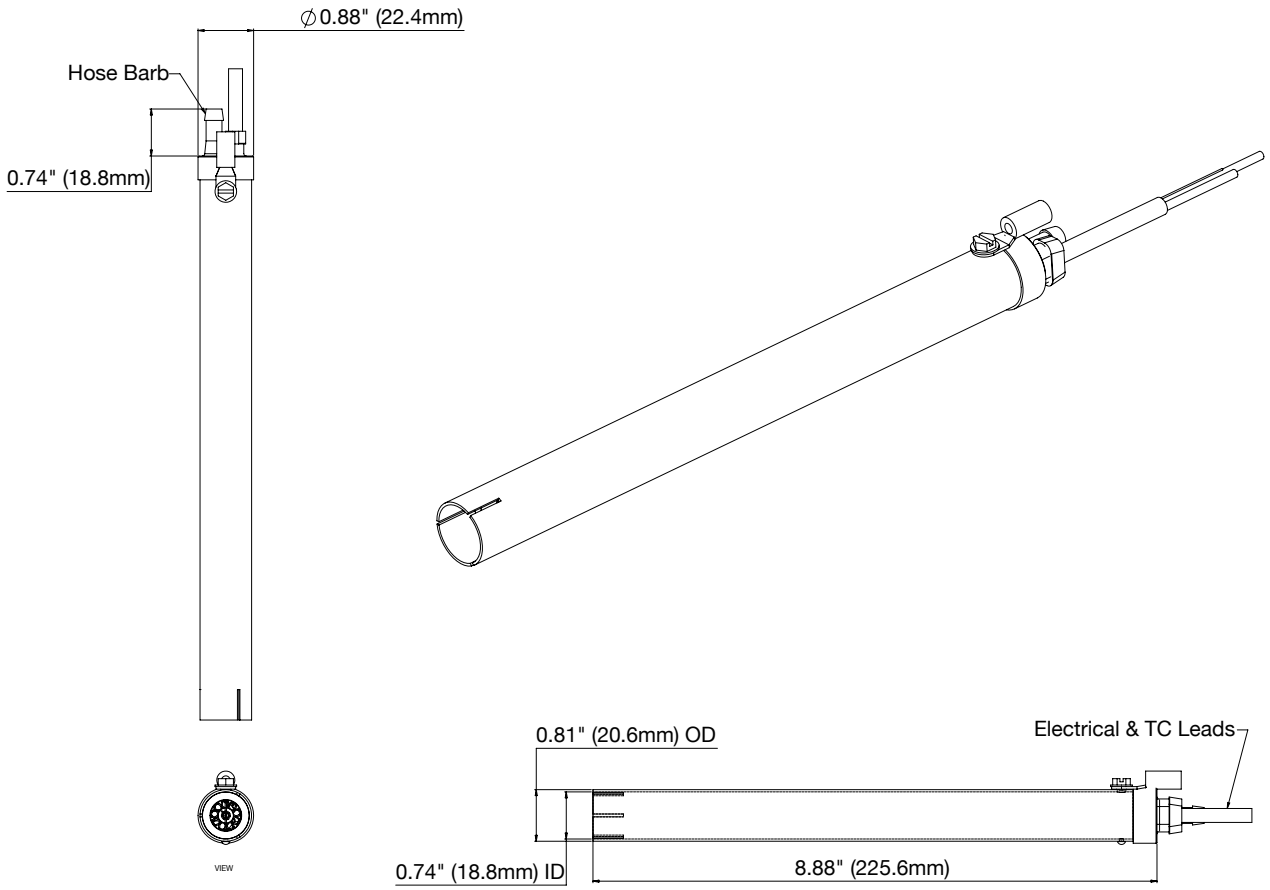
Closed-Loop Connection Diagram



Minimizing Hot Air Tools Element Failures

1. Always ensure air is flowing before powering the heating element
2. Slowly regulate the ramp up time using the potentiometer to control the AC voltage
3. Use a temperature controller with 100ms cycle time

Dimensions / Installation Reference



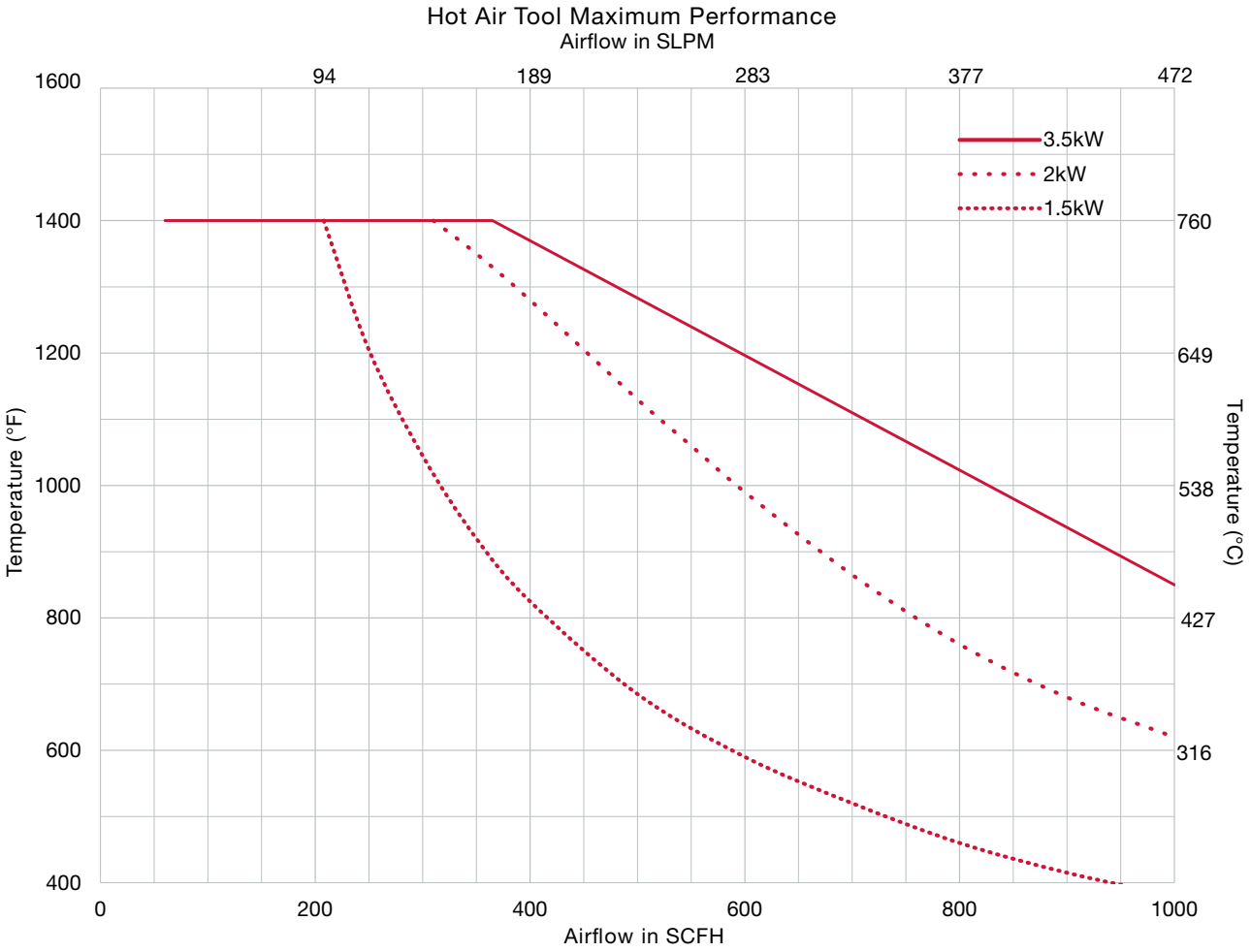
Hot Air Tools

Part Number	Max. Watt	Max. Volts	Max. Amps
F068462	1.5kW	120V	12.5A
F068463	2.0kW	240V	8.3A
F068464	3.5kW	240V	14.6A

Hot Air Tools Accessories

Part Number	Description
F068472	Flare Attachment Accessory
F066823	Closed-Loop SCR Power Controller
F076361	Digital Temperature Controller

Hot Air Tools Performance Curves



Notes:

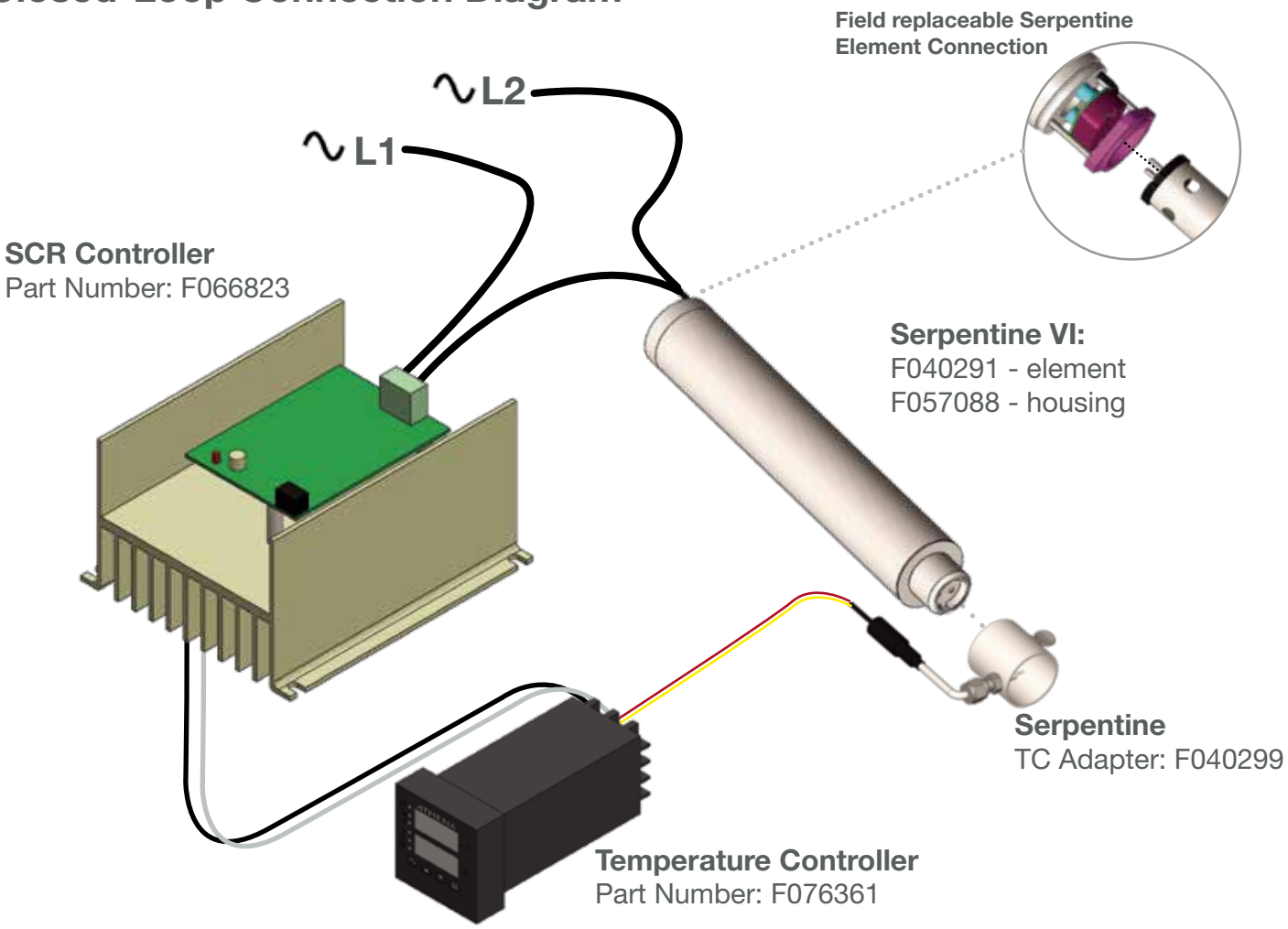
- Temperatures are measured by internal 'K' T/C sensors. Use of other sensor types and / or locations can result in heater damage.
- Minimum airflow for accurate control is 60 SCFH
- Maximum air temperature is 1400°F (760°C) with supplied "K" T/C. Operating above this curve will void the product warranty.

Serpentine II, VI Triple Pass Air Heaters

General Description

The Serpentine Triple Pass heaters are modular field replaceable products. The heater unit consists of a Serpentine-coil electric heater element that fits into a stainless steel “triple-pass”exchanger housing and makes electrical connections through fittings pressed into the base. The housing uses the incoming air to cool the outer shell prior to passing through the heater element. This minimizes radiant heat loss and provides a safe to the touch product to minimize injury to operators who come in contact with the heater.

Closed-Loop Connection Diagram



Serpentine II, VI Accessories

Part Number	Description
F039739	Serpentine II Base Adapter Assembly
F042339	Serpentine VI Base Adapter Assembly
F029485	Serpentine II TC Holder (includes TC)
F040299	Serpentine VI TC Holder (includes TC)
F039272	Type K thermocouple probe

Dimensions / Installation Reference

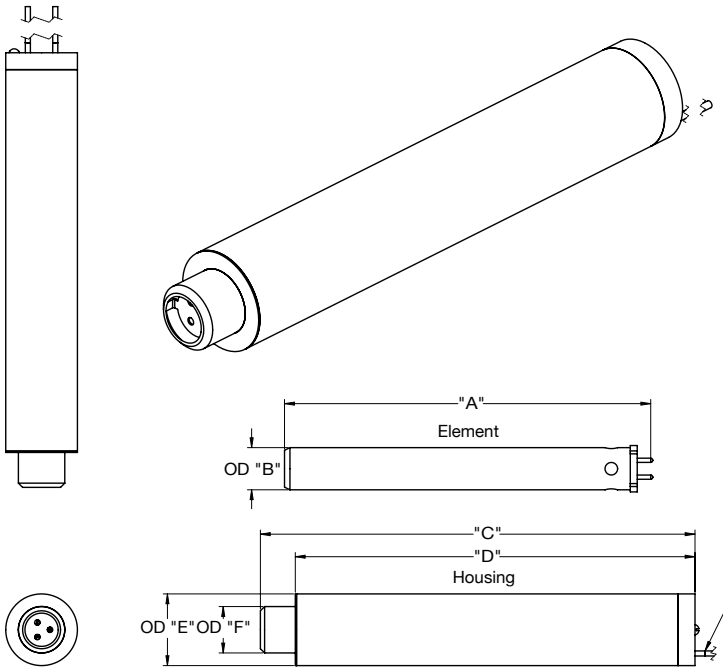


Figure 1

Serpentine VI
Radius Edge Elements
(F076634, F076635)
Often used in OEM housing applications producing rolled edge paper cups, to avoid air leakage issues.

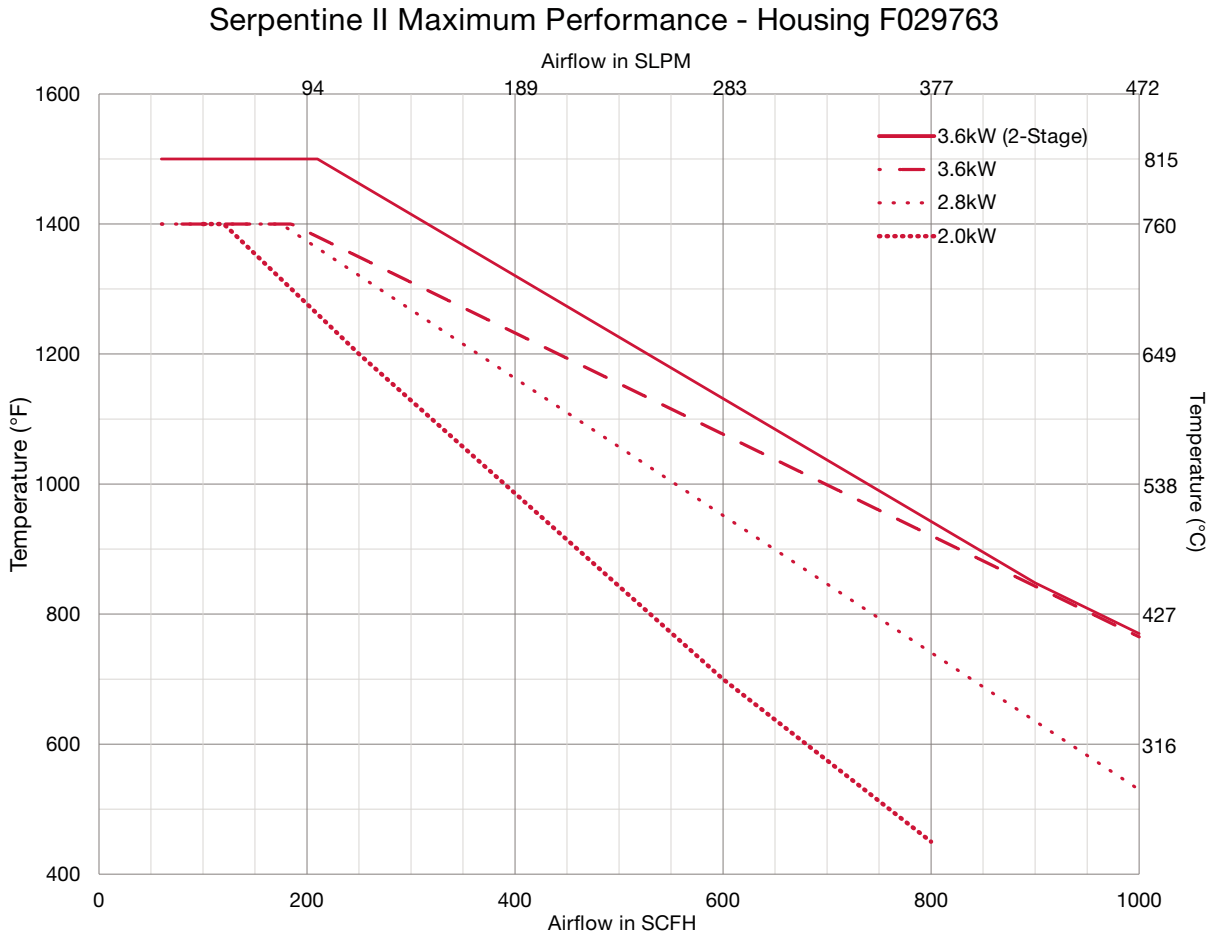
Serpentine Elements

Part Number	Max. Watts	Max. Volts	Max. Amps	Length “A”	Diameter “B”
Serpentine II Elements					
F029765	2.0kW	240V	8A	8.20” / 208mm	0.63” / 16mm
F029766	2.8kW	240V	12A	8.20” / 208mm	0.63” / 16mm
F029767	3.6kW	240V	15A	8.20” / 208mm	0.63” / 16mm
F060418	3.6kW(2-stage)	240V	15A	8.63” / 219mm	0.63” / 16mm
Serpentine VI Elements					
F040291	5.0kW	240V	21A	10.88” / 276mm	1.25” / 32mm
F040292	6.0kW	240V	25A	10.88” / 276mm	1.25” / 32mm
F076634 (see fig.1)	6.0kW	240V	25A	10.88” / 276mm	1.25” / 32mm
F061429	6.0kW(2-stage)	240V	25A	10.88” / 276mm	1.25” / 32mm
F056548	8.0kW	240V	33A	10.88” / 276mm	1.25” / 32mm
F076635 (see fig.1)	8.0kW	240V	33A	10.88” / 276mm	1.25” / 32mm

Serpentine Housing Assemblies

Part Number	Dimensions				
	“C”	“D”	“E”	“F”	“G”
Serpentine II Housing F029763	10.0” / 254mm	9.0” / 229mm	1.6” / 40mm	0.7” / 18mm	3/8” NPT
Serpentine VI Housing F057088	12.9” / 327mm	11.9” / 302mm	2.1” / 54mm	1.4” / 35mm	3/4” NPT

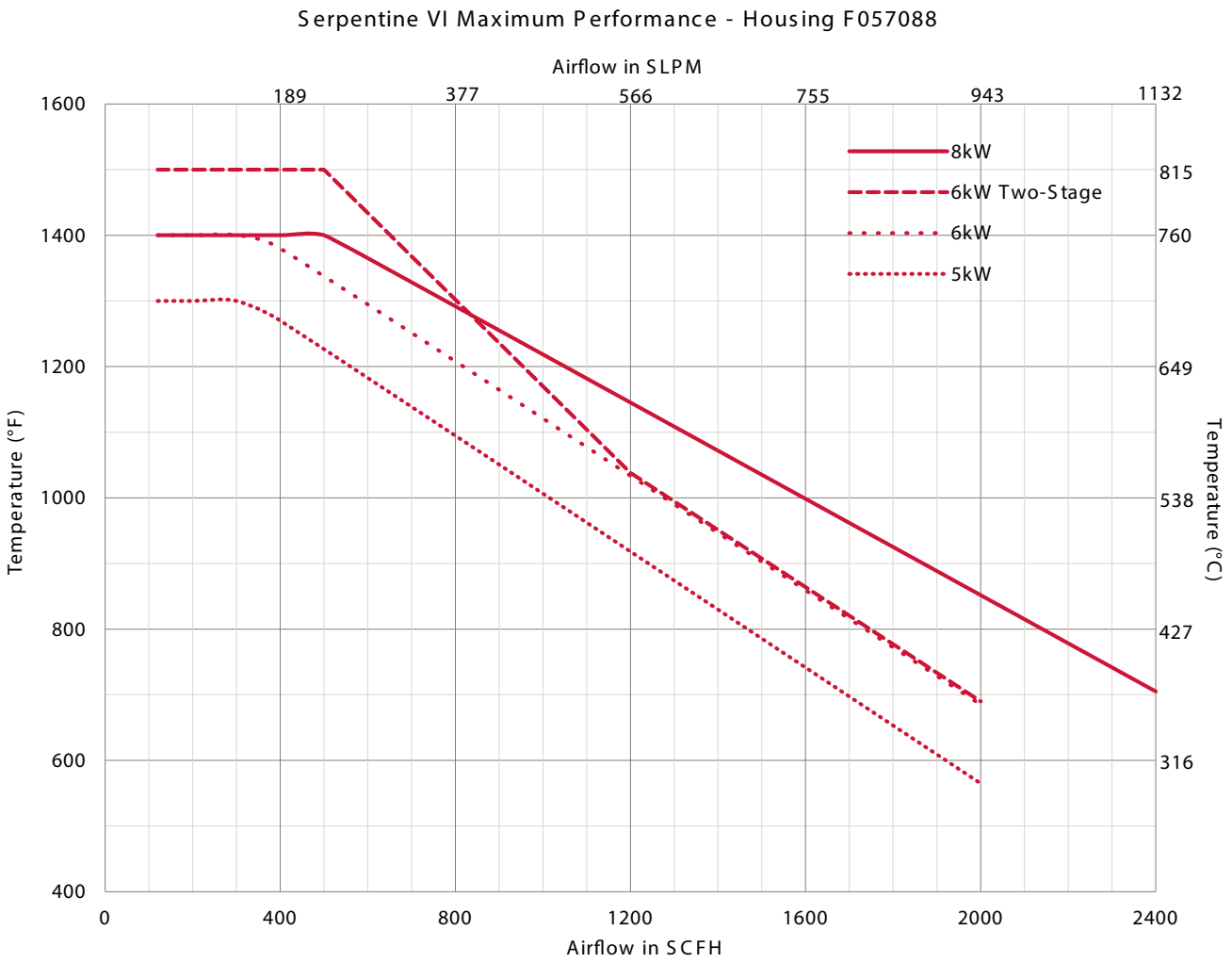
Serpentine II Performance Curves



Notes:

- Temperatures are measured by internal 'K' T/C sensors.
- Use of other sensor types and locations can result in heater damage.
- Minimum airflow for accurate control is 60 SCFH
- Maximum air temperature is 1500°F (815°C)
- Operating above this curve will void the product warranty

Serpentine VI Performance Curves



Notes:

- Temperatures are measured by 3/16" "K" T/C sensor Part #039272 mounted inside TC holder #040299
- TC Holder mounted on exit of #F057088
- Housing Assembly
- Use of other sensor types and mounting locations can result in heater damage
- Minimum airflow for accurate control is 60 SCFH
- Maximum air temperature is 1500°F (815°C)
- Operating above this curve voids the product warranty

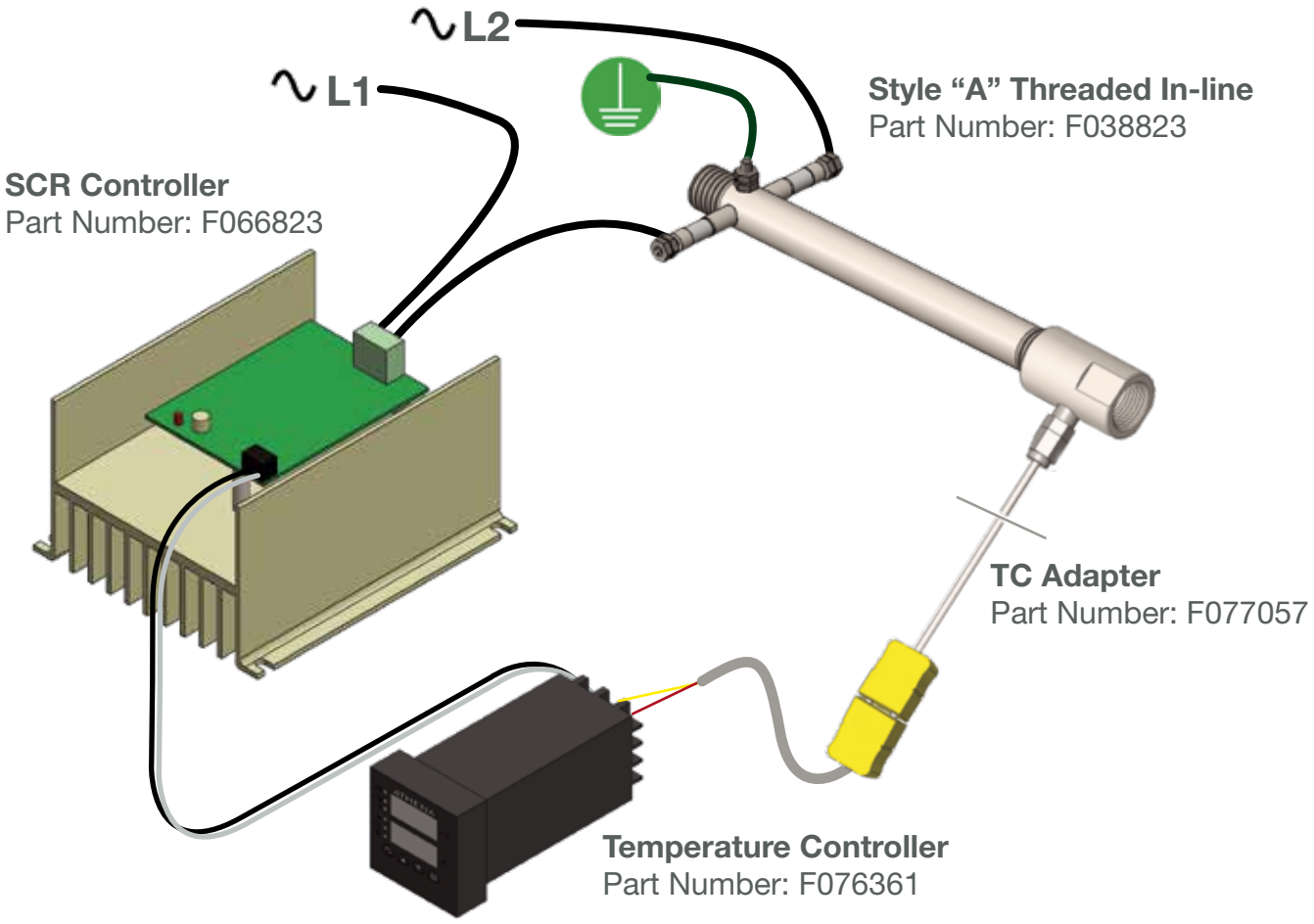
CE RoHS

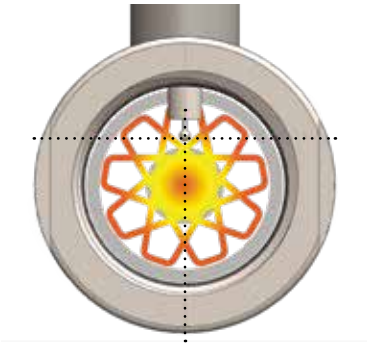
Threaded In-line Heaters

General Description

Threaded in-line air heaters are UL Recognized products designed for industrial process heating applications requiring high-heat and high air pressure. Serpentine™ heating elements are installed into a 304 stainless steel housing and threaded at both ends. Tutco SureHeat threaded in-line heaters offer two styles, Style “A” and Style “B”. Style “A” should be used when an absolute leak-proof air system is required. Need a custom solution? We have supplied hundreds of customer specified variations. Contact us for more information.

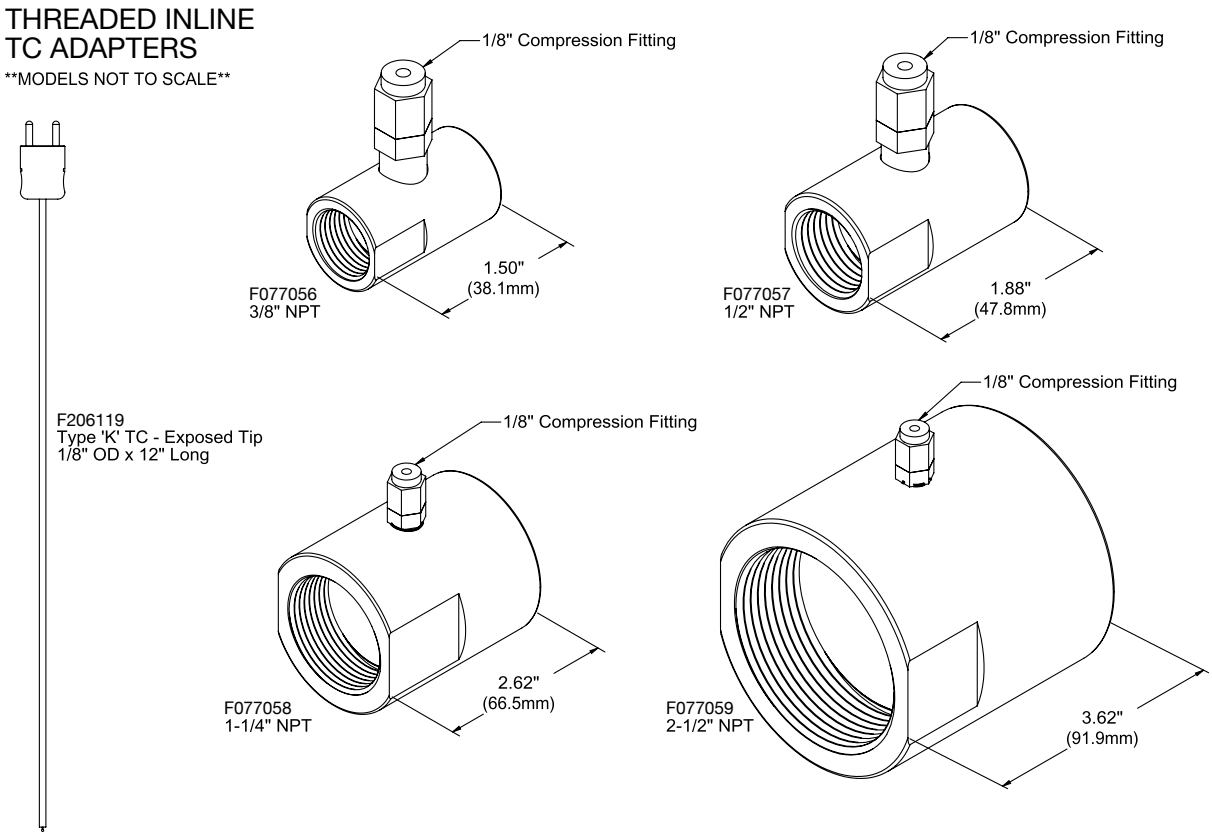
Closed-Loop Connection Diagram





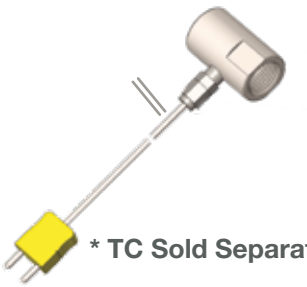
Make sure to properly mount the TC coupling so that the TC is slightly above the ceramic rod running through the center of the Serpentine™ heating element. The open end of the TC should be in the heated air stream as shown left.

Threaded In-line Thermocouple Adapters



Threaded In-line Thermocouple Adapters

Part Number	Description
F077056	TC Adapter 3/8” Threaded In-line
F077057	TC Adapter 1/2” Threaded In-line
F077058	TC Adapter 1-1/4” Threaded In-line
F077059	TC Adapter 2-1/2” Threaded In-line
F206119	1/8” TC Type K 12” Probe



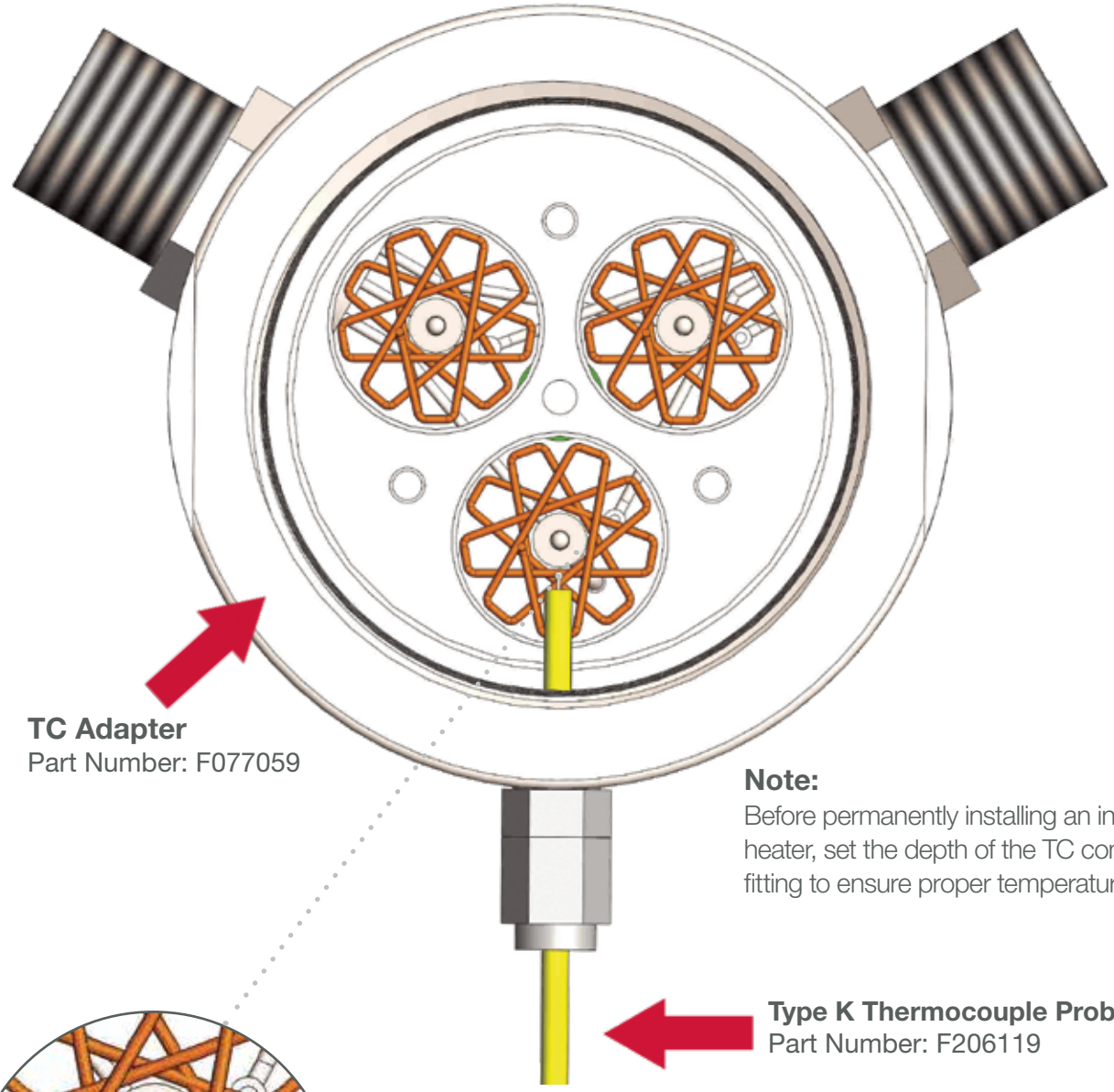
*** TC Sold Separately**

Notes:

- Threaded In-line thermo couple adapter material is 316 stainless steel
- Better resistance to oxidation at higher temperatures
- Type K thermocouple F206119 sold separately
- Use of other sensor types and mounting locations can result in heater damage
- Thermocouple mounting depth location is critical. Follow all mounting instructions.
- If replacing a Thermocouple, take note of the depth by measuring the distance to the compression fitting on the old Thermocouple.

Thermocouple Installation Reference

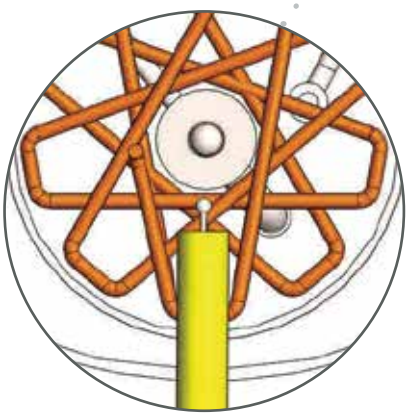
2-1/2” NPT Threaded In-line Heater Assembly Part Number: F074439



TC Adapter
Part Number: F077059

Note:
Before permanently installing an in-line heater, set the depth of the TC compression fitting to ensure proper temperature control.

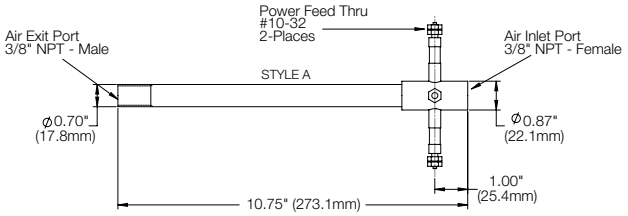
Type K Thermocouple Probe
Part Number: F206119

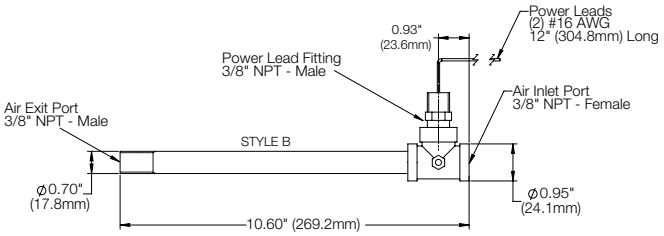


The 2-1/2” Threaded In-line Heater has three elements. When threading the adapter onto the NPT pipe, make sure to properly align and mount the TC coupling so that the TC is 3/16” off the center of the ceramic rod running through the center of the Serpentine™ heating element. The open end of the TC should be in the heated air stream as shown left.

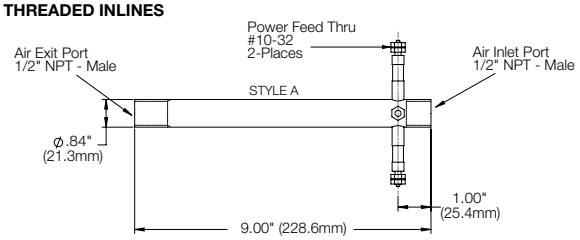
Dimensions / Installation Reference

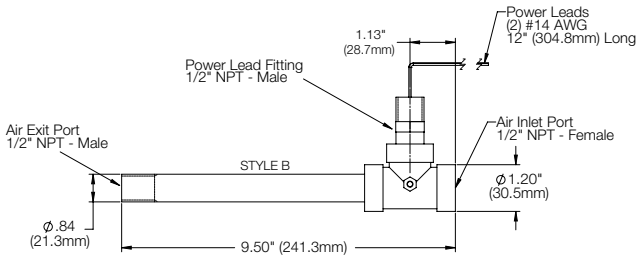
3/8" THREADED INLINES



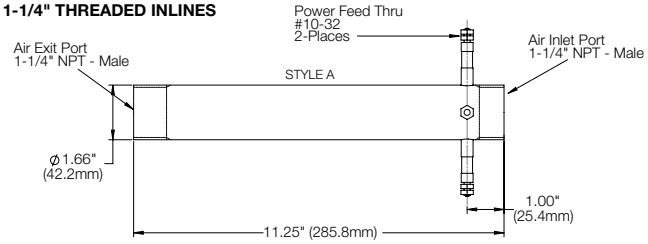


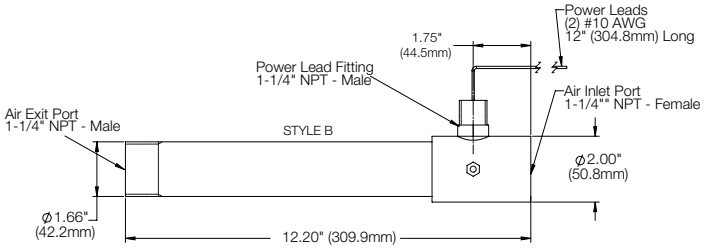
1/2" THREADED INLINES



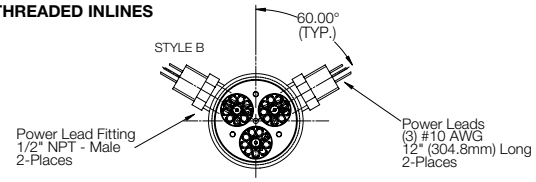


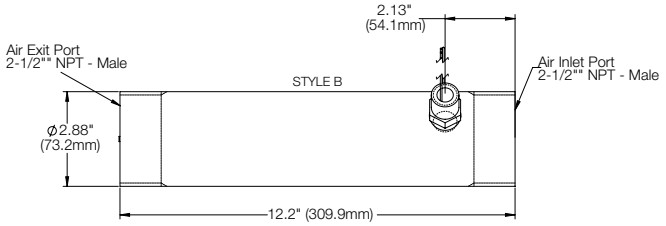
1-1/4" THREADED INLINES





2-1/2" THREADED INLINES





Threaded In-line Products

Size (NPT)	Max. Power	Max.Volts	Max. Amps	P/N, Style "A"	P/N, Style "B"
3/8"	1.6kW	170	9.4	F038821	F038822
1/2"	4.0kW	220	18.2	F038823	F038824
1-1/4"	6.0kW	220	27.3	F038825	F038826
1-1/4"	8.0kW	240	33.3	F077065	F077028
2-1/2"	18.0kW	240	75.0 (1ø)/44.0 (3ø)	N/A	F063007
2-1/2"	18.0kW	480	21.7 (3ø)	N/A	F076418
2-1/2"	24.0kW	240	100.0 (1ø)/57.8 (3ø)	N/A	F074439

Style A / Style B Installation Reference

Style A Threaded In-line Products

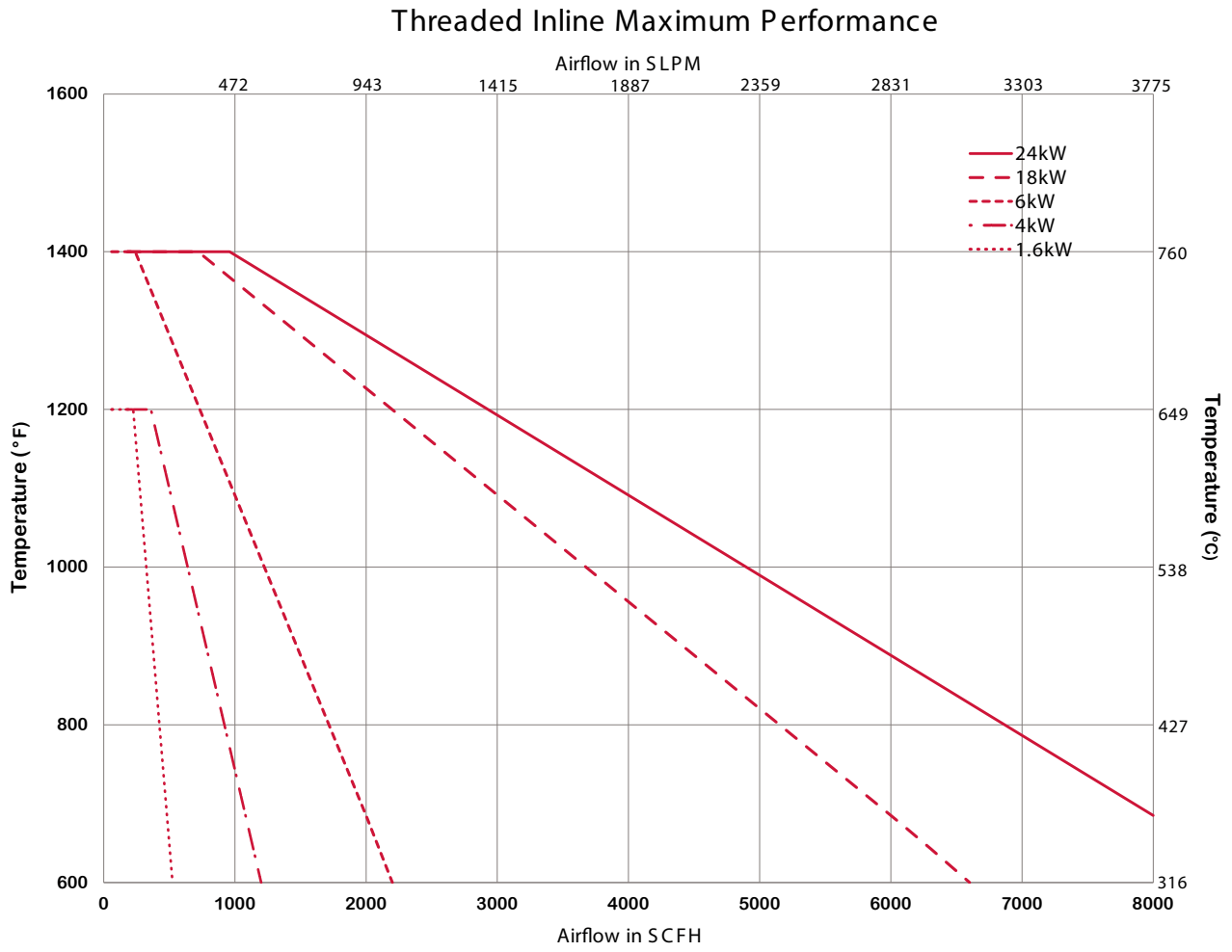
- UL Recognized
- High-pressure power feed throughs
- Leak-proof to 150 psi (10 bar)
- Maximum inlet temperatures 900°F (482°C)

The inlet side of the heater is located closest to the power feed throughs. Installation orientation is critical. Positioning the heater in the wrong direction will cause damage. Like all Tutco SureHeat products, do not operate without air flow.

Style B Threaded In-line Products

- UL Recognized
- 12” (305mm) flexible wire power leads
- Not recommended for leak-proof systems due to slight leakage through wire strands
- Maximum inlet temperatures 200°F (93°C)

Threaded In-line Performance Curves



Notes:

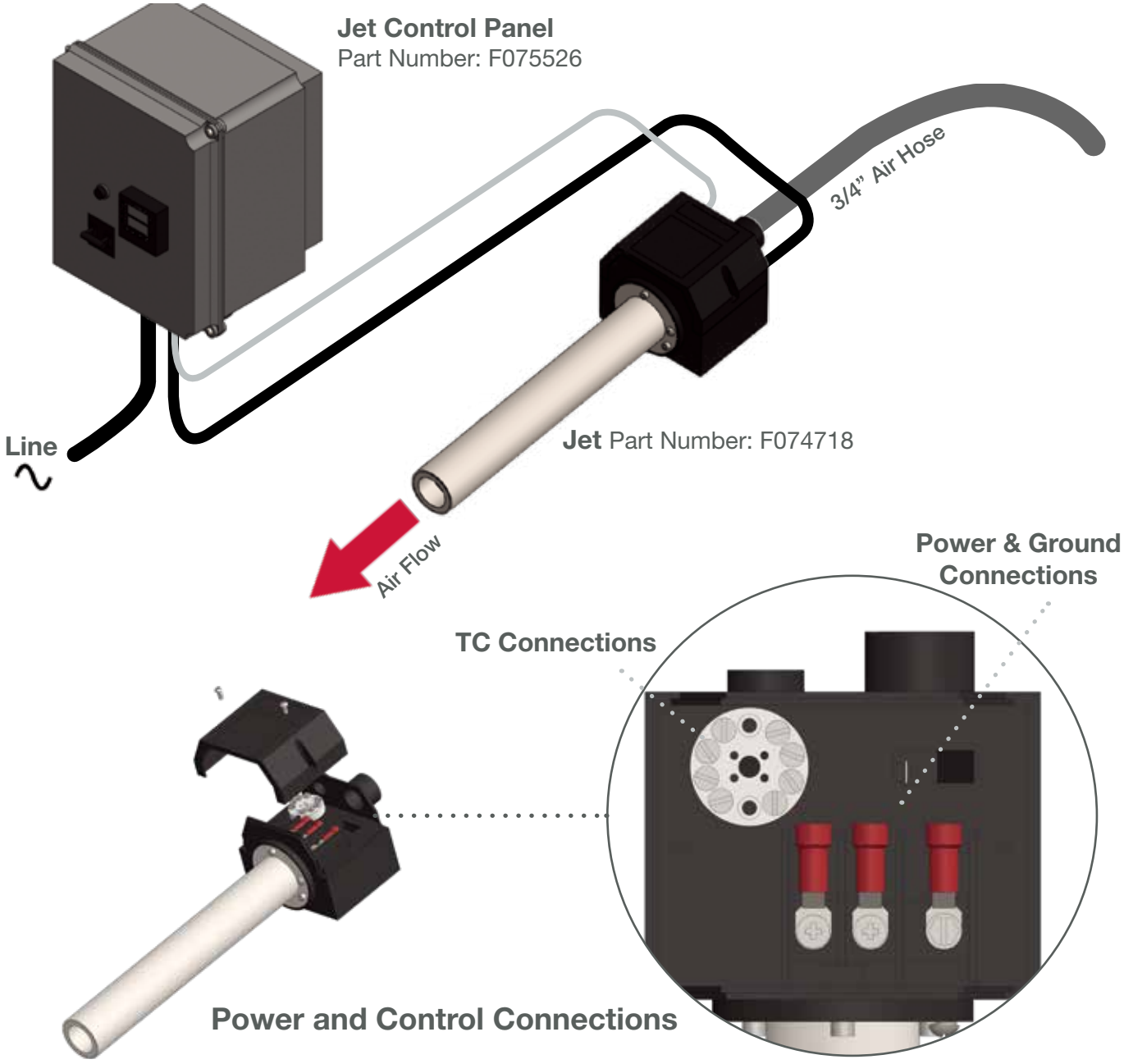
- Temperatures are measured by 3/16" "K"
- Thermocoupler Probe F039272 mounted inside TC adapter of the same NPT size
- Use of other sensor types and mounting locations can result in heater damage
- Minimum airflow for accurate control is 60 SCFH
- Maximum air temperature is 1400°F (760°C)
- Operating above this curve voids the product warranty

Jet Air Heater

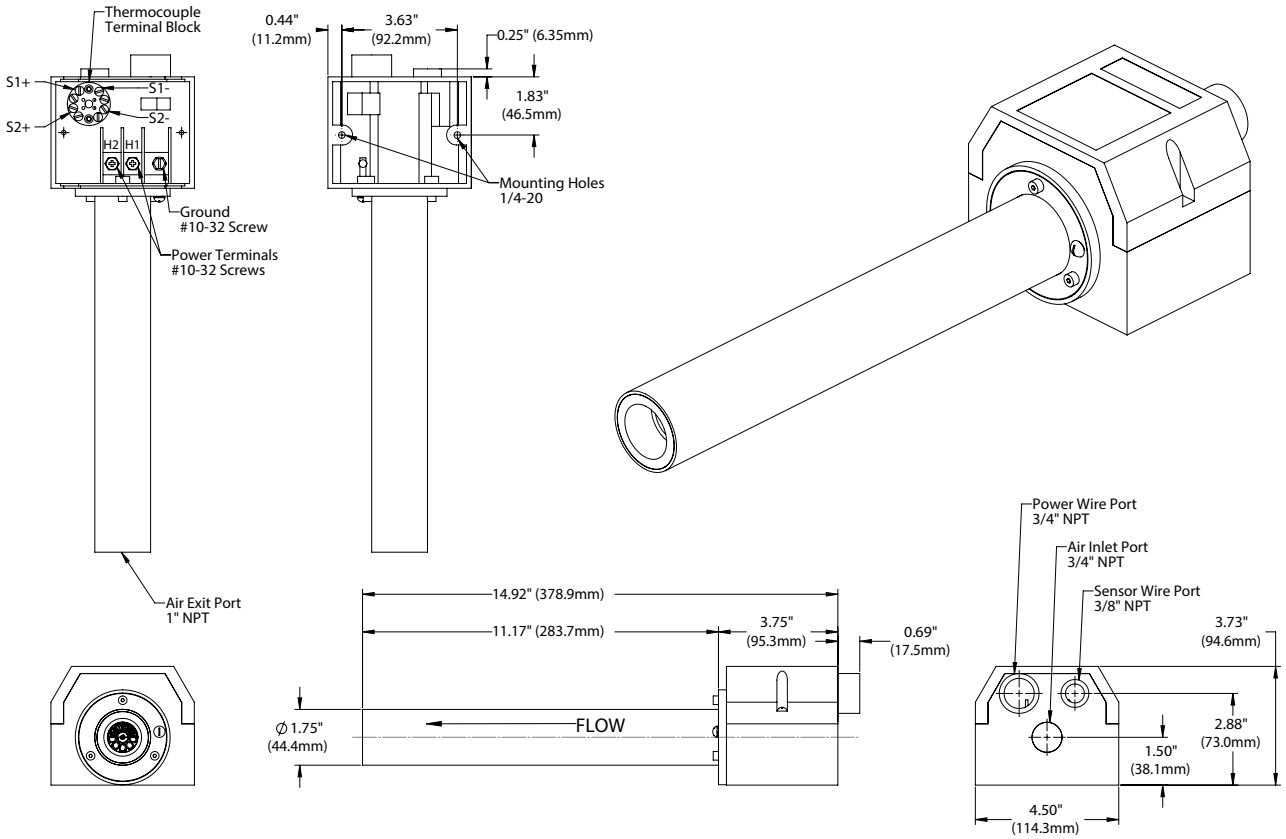
General Description

The JET provides a compact and efficient heater solution for air temperatures up to 1400°F (760°C). Available in a 3.0kW or 8.0kW, 240V 1ø unit, the Jet offers two type “K” thermocouples with a convenient terminal block for easy wiring. To ensure safety, power and perfect control, connect with the optional Jet Control Panel. Each heater has a convenient method for mounting the housing and offers a ground stud located at the inlet of the heater.

Closed-Loop Connection Diagram



Dimensions / Installation Reference



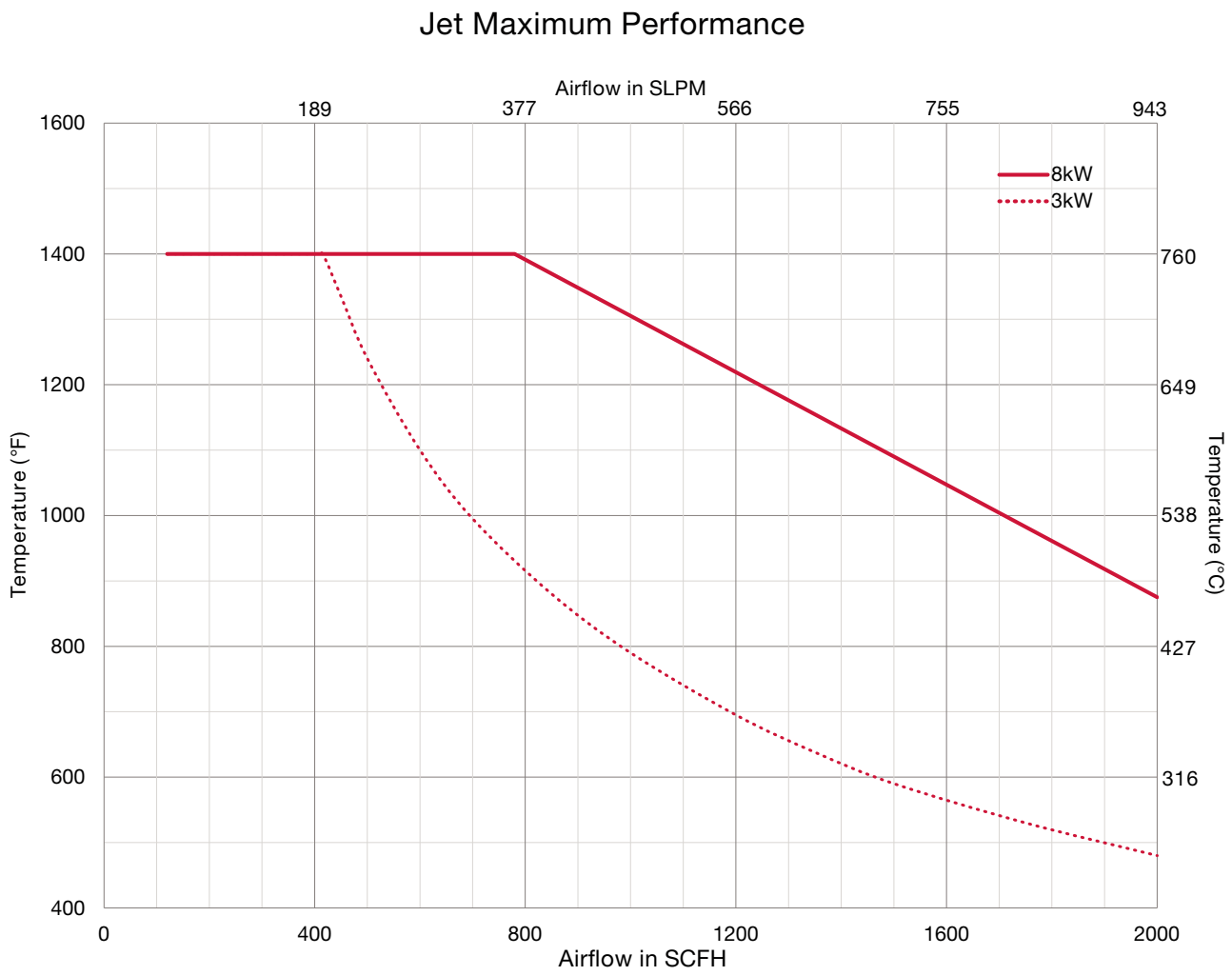
Jet Products

Part Number	Power kW	Max. Volts / ø	Max. Amps
F074718	3.0	240 / 1	12.5
F074719	8.0	240 / 1	33.3

Jet Control Products

F075526	8.0	240 / 1	40

Jet Performance Curve



Notes:

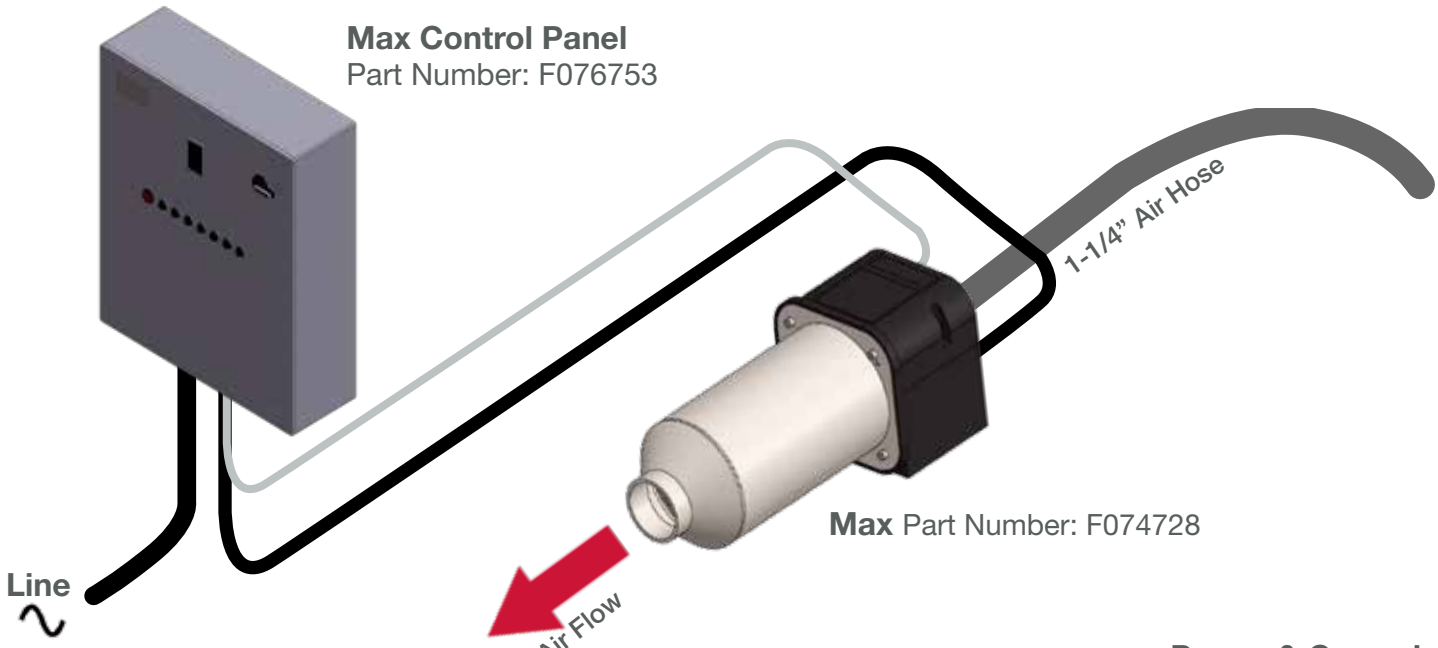
- Temperatures are measured by internal “K” T/C sensors located inside the Jet Housing
- Use of other sensor types and/or locations can result in heater damage
- Minimum airflow for accurate control is 2 SCFM
- Maximum air temperature is 1400°F (760°C)
- Operating above temperature voids the product warranty

Max Air Heater

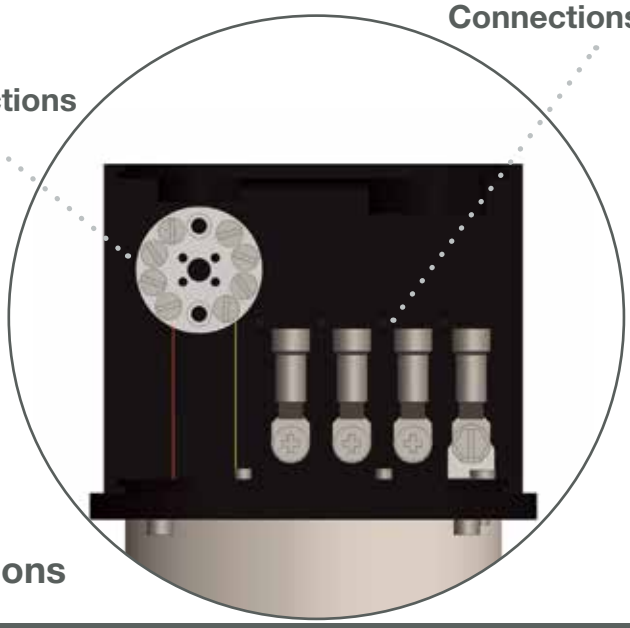
General Description

The Max provides a compact and efficient heater solution for air temperatures up to 1400°F (760°C). Available in a 6.0kW to 36.0kW, 240V/380V/480V 1ø / 3ø units, the Max offers two type “K” thermocouples with a convenient terminal block for easy wiring. To ensure safety, power and perfect control, connect with the optional Max Control Panel. Each heater has a convenient method for mounting the housing and offers a ground stud located at the inlet of the heater.

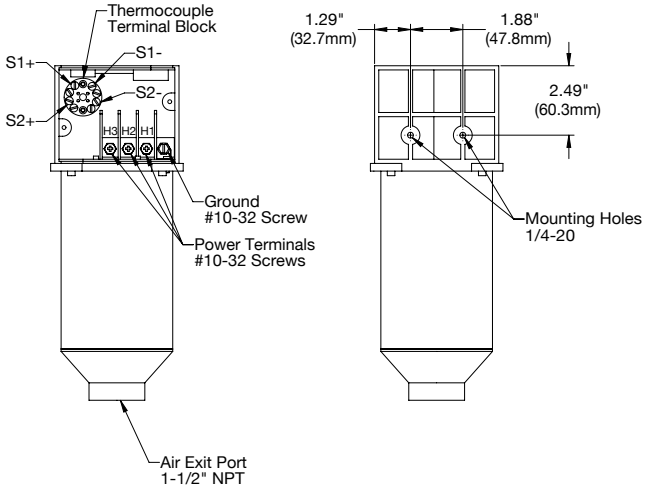
Closed-Loop Connection Diagram

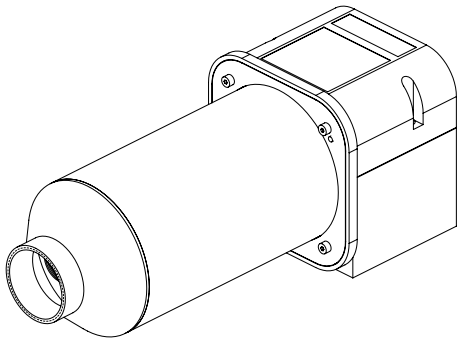


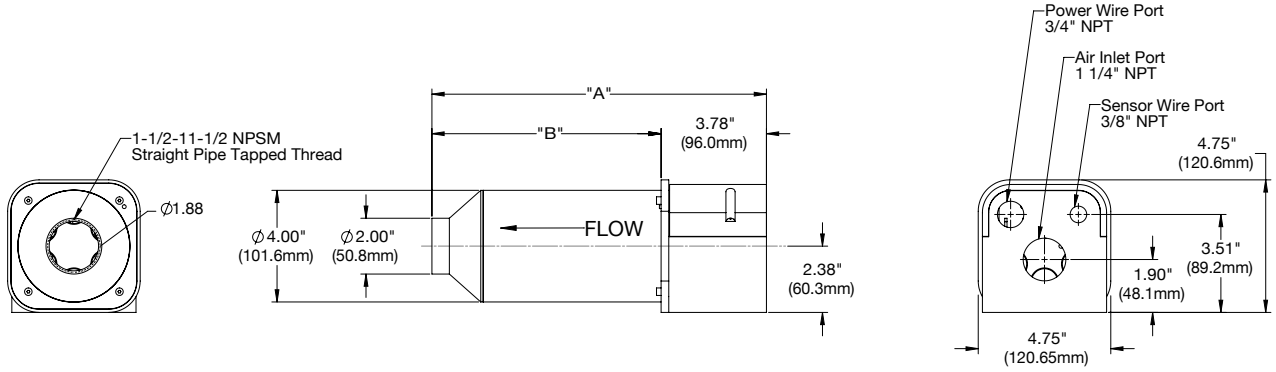
Power and Control Connections



Dimensions / Installation Reference



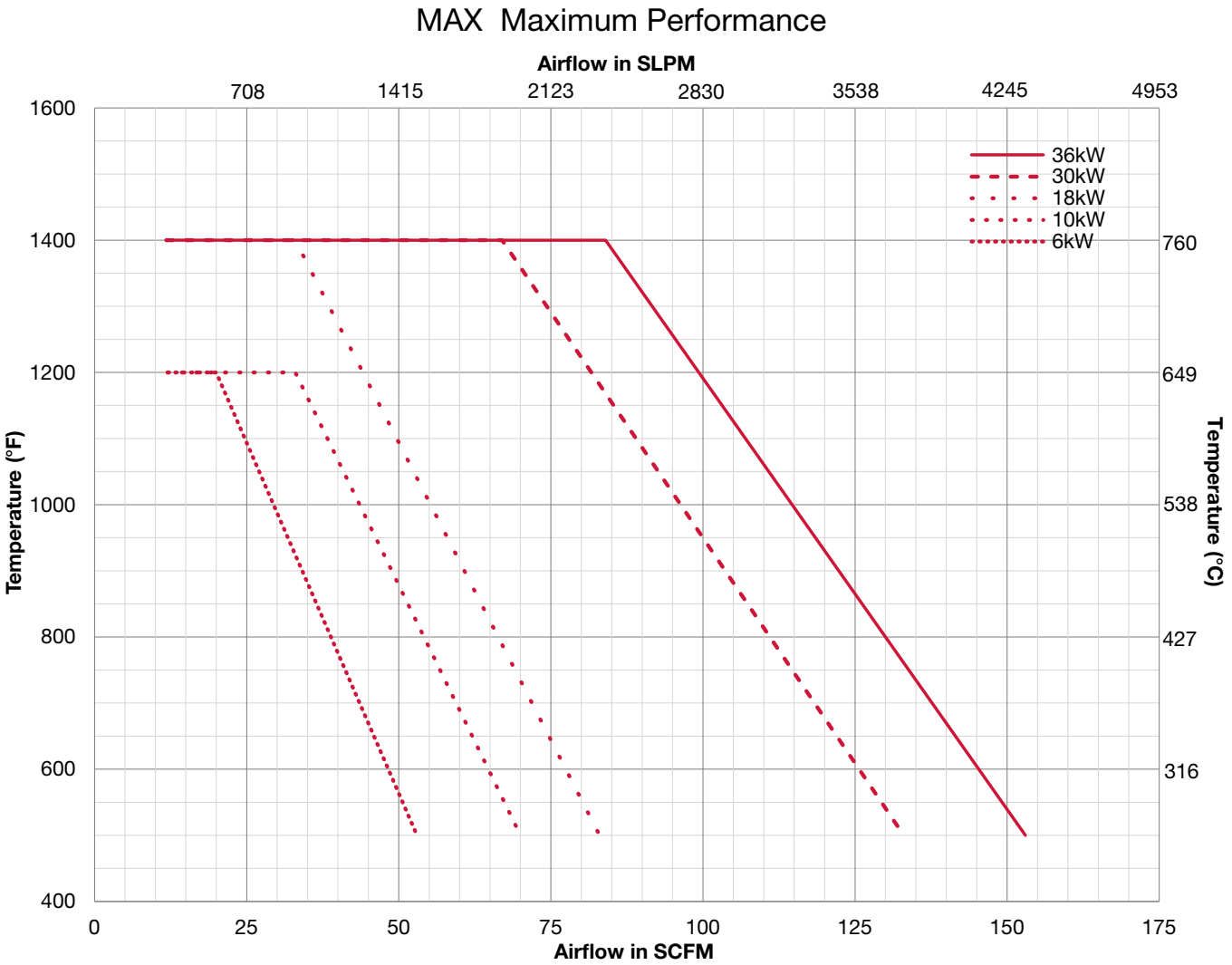




SureHeat® Max Products

Part Number	Power kW	Max. Volts / ø	Max. Amps	Dim "A" "(mm)	Dim "B" "(mm)
F074723	6.0	240 / 1	25	12 (304.8)	8.21 (208.53)
F074724	6.0	240 / 3	14.5	12 (304.8)	8.21 (208.53)
F074725	6.0	380 / 3	9.1	12 (304.8)	8.21 (208.53)
F074726	6.0	480 / 3	7.2	12 (304.8)	8.21 (208.53)
F074727	10.0	240 / 1	41.7	12 (304.8)	8.21 (208.53)
F074728	10.0	240 / 3	24.1	12 (304.8)	8.21 (208.53)
F074729	10.0	380 / 3	15.2	12 (304.8)	8.21 (208.53)
F074731	10.0	480 / 3	12.0	12 (304.8)	8.21 (208.53)
F074732	18.0	240 / 3	43.4	16 (406.4)	12.21 (310.2)
F074733	18.0	380 / 3	27.4	16 (406.4)	12.21 (310.2)
F074734	18.0	480 / 3	21.7	16 (406.4)	12.21 (310.2)
F074735	30.0	380 / 3	45.6	16 (406.4)	12.21 (310.2)
F074736	36.0	480 / 3	43.4	16 (406.4)	12.21 (310.2)

Max Performance Curve



Notes:

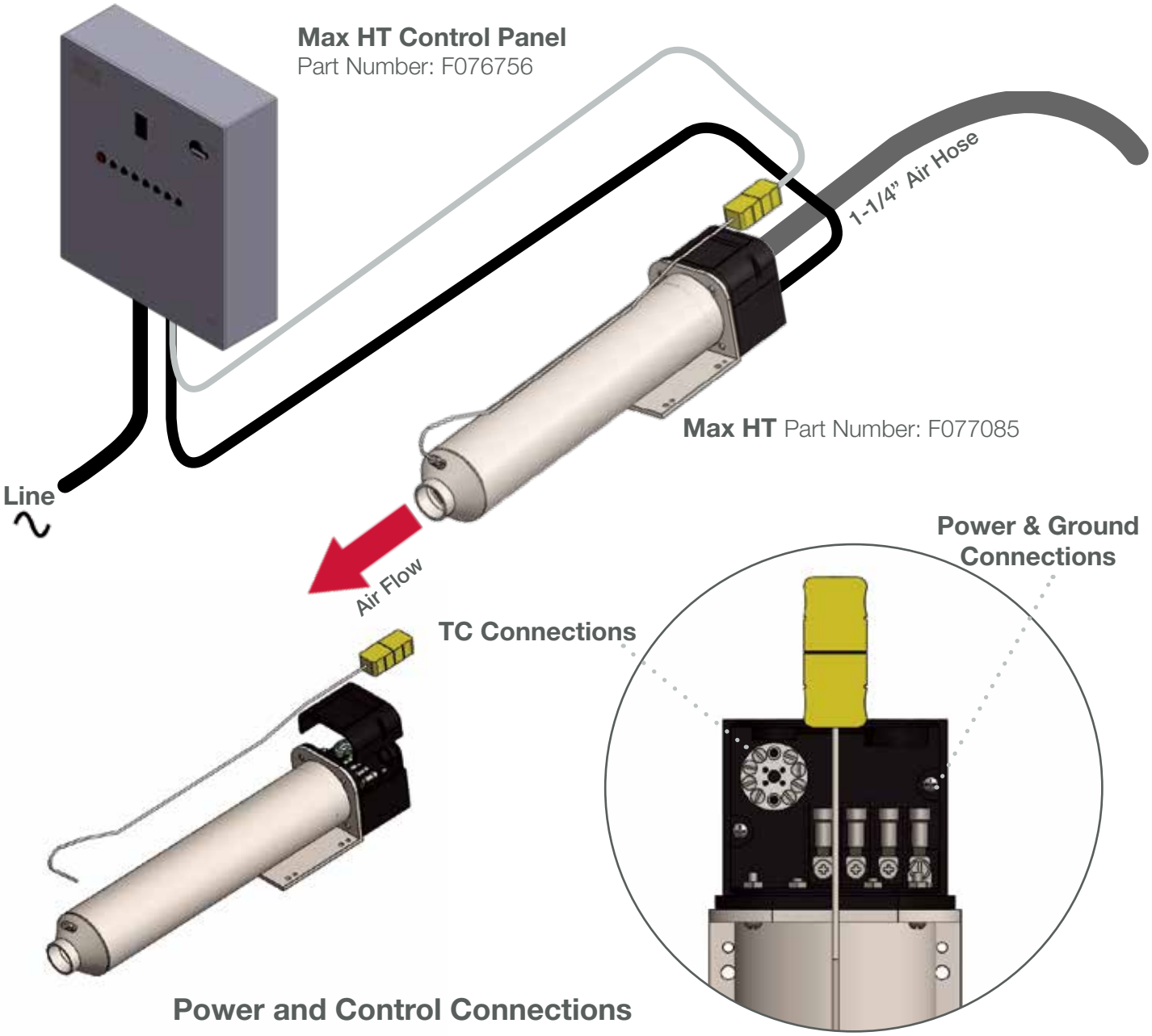
- Temperatures are measured by internal “K” T/C sensors located inside the Max Housing
- Use of other sensor types and/or locations can result in heater damage
- Minimum airflow for accurate control is 12 SCFM
- Maximum air temperature up to 1400°F (760°C)
- Operating above temperature will void the warranty

Max HT Air Heater

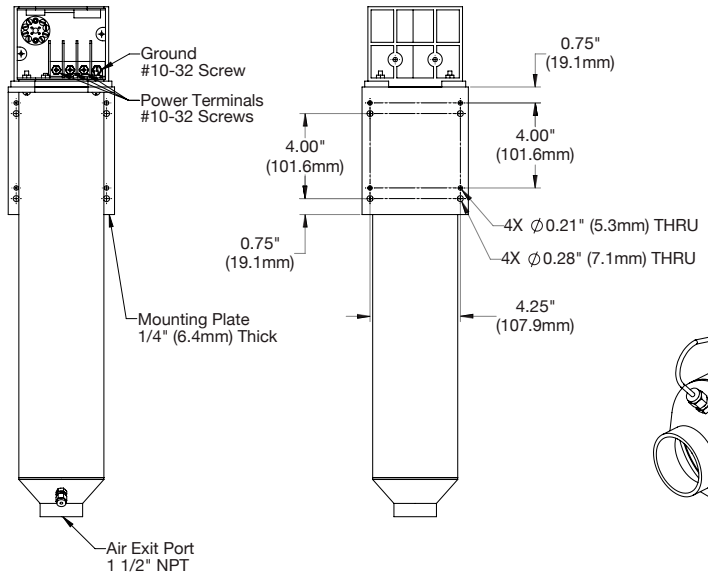
General Description

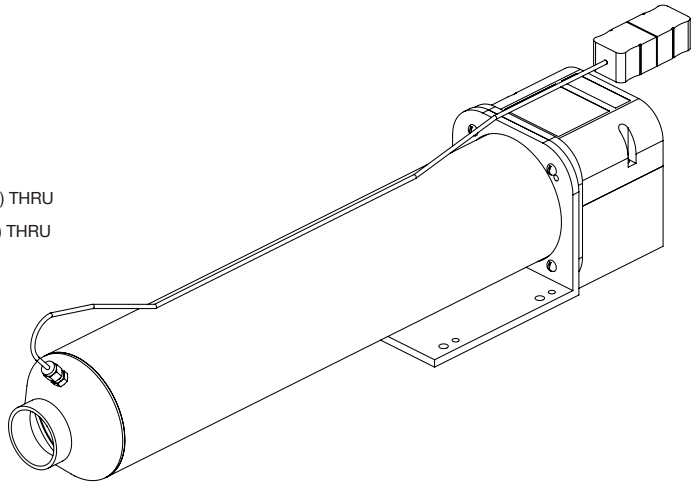
The Max HT provides a compact and efficient heater solution for high temperature applications up to 1652°F (900°C). A dual type "K" thermocouple with a convenient terminal block is included for ease of wiring. Each exposed thermocouple is used to measure inlet and exit air temperature. One is typically used for process temperature control and the other to monitor high temperature limit. Each heater has a convenient method for mounting the housing and offers a ground stud located at the inlet of the heater.

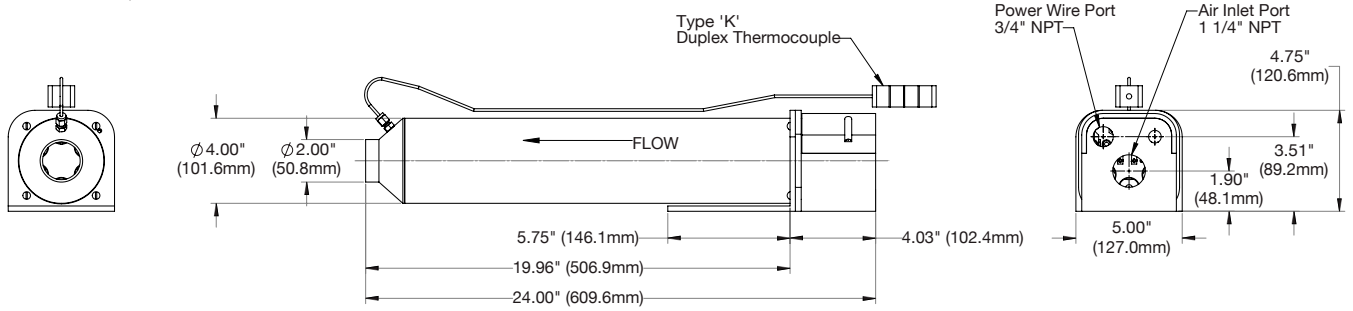
Closed-Loop Connection Diagram



Dimensions / Installation Reference



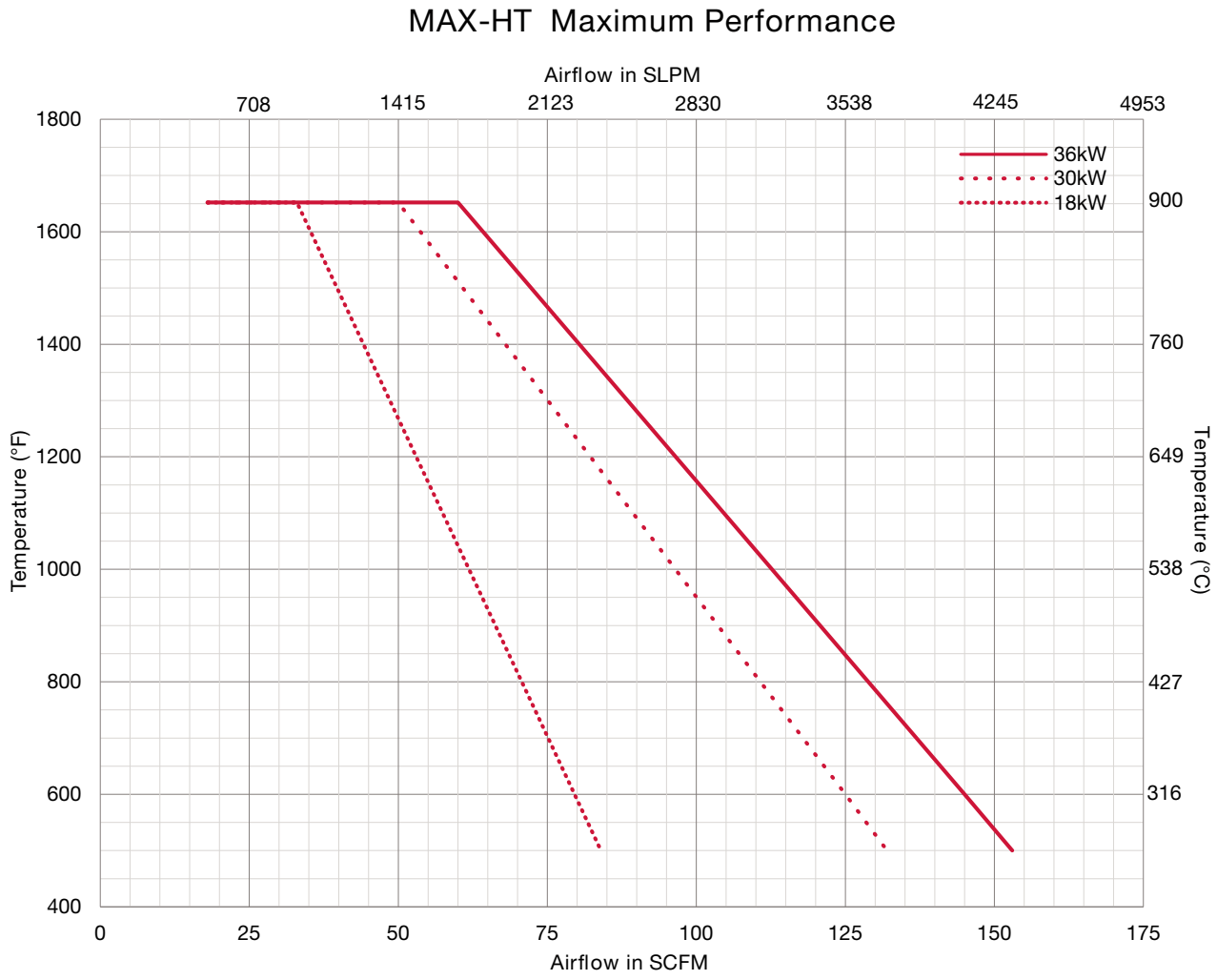




SureHeat® Max HT Products

Part Number	Power kW	Max. Volts / ø	Max. Amps	Replacement Element
F077081	18.0	240 / 3	43.4	F206707
F077082	18.0	380 / 3	27.4	F206662
F077083	18.0	480 / 3	21.7	F206663
F077084	30.0	380 / 3	45.6	F206664
F077085	36.0	480 / 3	43.4	F206598

SureHeat® Max HT Performance Curve



Notes:

- Temperature is measured by a dual “K” T/C sensor located inside the Max HT Housing
- Use of other sensor types and/or locations can result in heater damage
- Minimum airflow for accurate control is 18 SCFM
- Maximum air temperature is 1652°F (900°C)
- Operating above temperature will void the warranty

Troubleshooting Heaters

1. Heater element life is dependent on proper control and element wire temperature. The estimated life-cycle is based on the heater element operating at or below temperatures specified. Most element failures are due to low air flow or damage associated to power control and voltage ramp up rates.
2. If an element has failed prematurely, it should be inspected to determine the cause of the failure.
3. Determining the cause will prevent the same problem from reoccurring.
4. When replacing or troubleshooting heaters, turn off the power and be sure to follow all lock-out / tag-out electrical panel procedures.
5. With the power off, and the heater disconnected, use a multimeter to check continuity between the heater power terminals. (H1/H2, H2/H3 and H1/H3)
6. If there is no continuity, please contact Tutco SureHeat technical support for assistance.
7. If there is continuity on all of the above tests, please check the system wiring.
8. Crossed thermocouple wires, reversed thermocouple wiring and incorrect air inlet temperature settings can cause undesired operation. If you discover a wiring issue, resolve it, reconnect and test the heater.
9. Verify thermocouple wiring, (+ yellow and - red)
10. Verify that the inlet air temperature is below the set point on the inlet temperature controller.

Identifying Overshoot Element Damage

Overshoot damage with airflow present

Overshoot damage without airflow present

Note:
Overshoot can occur even with airflow present. Damage by overshoot is easily identified because it occurs near the air exit end of the heater. See photo examples to the left.

Before installing a replacement, it is important to correct the voltage overshoot.

Determining Process Air Heater Needs

Custom solutions are available

Please use the form below to determine your air heater requirements.

Type of Application:	
Mass Airflow Rate:	☐ SCFM ☐ Lbs/min ☐ Kg/sec ☐ Other _____
Air (Gas) Supply:	☐ Air Compressor ☐ Blower / Fan
System Air Pressure:	☐ PSI ☐ Bar ☐ Other _____
Inlet Air Temperature:	☐ °F Fahrenheit ☐ °C Celsius ☐ °K Kelvin
Exit Air Temperature:	☐ °F Fahrenheit ☐ °C Celsius ☐ °K Kelvin
Type of Air (Gas) Heated:	
Power Available:	☐ 120V ☐ 208V-240V ☐ 380V-400V ☐ 480V ☐ Other _____ ☐ 1Ø ☐ 3Ø

Optional Information

While not required, this information can help you consider variables and challenges during the installation phase.

Max. System Air Pressure Drop:	☐ PSI ☐ Bar ☐ Other _____
Expected Heater Run-Time: (hrs/day)	
Required Heater Ramp-Up Time:	
Heater Mounting Requirements:	
Heater Nozzle Requirements:	
Special Safety Requirements:	
Submit to: support@tutcosureheat.com	

Reference Data

Air Heater Power Requirement

kW = SCFM x (Exit Temp - Inlet Temp) / 2500
or
kW = SCFM x (Exit Temp - Inlet Temp) /3000 x 1.2

Air Flow Conversions

SCFM = SCFH / 60 = SLPM / 28.3
SLPM = SCFH / 2.12
SCMH = SCFH / 35.3
SCFM = (pounds of air per minute) / (0.076 lbs / ft^3)
SCFM = grams / sec x 1.74
SCFM = kg / min x 28.9

Single Phase Wiring

V = I x R (Volts = Amps x Ohms)
I = W / V (Amps = Watts / Volts)
W = V^2 / R (Watts = (Volts x Volts) / Ohms

Three Phase Delta Wiring

$R = R_1 = R_2 = R_3$
$W_{delta} = 3 (V_L^2) / R$
$W_{delta} = 1.73 \times V_L \times I_L$
$IP = I_L / 1.73$
$VP = V_L$

Three Phase Wye Wiring

$R = R_1 = R_2 = R_3$
$W_{wye} = (V_L^2) / R = 3 (V_P^2) / R$
$W_{wye} = 1.73 \times V_L \times I_P$
$IP = I_L$
$VP = V_L / 1.73$

Temperature Conversions

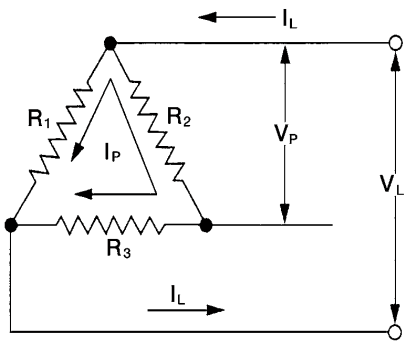
°F = 9/5 (°C + 32) or °F = °C x 1.8 + 32
°C = 5/9 (°F - 32) or °C = °F - 32 / 1.8

Air Flow Abbreviations

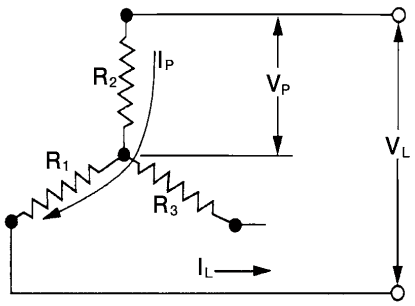
SCFM = standard cubic feet per minute
SCFH = standard cubic feet per hour
SLPM = standard liters per minute
SCMH = standard cubic meters per hour

Thermocouple Wiring / Configuration Type K

(+) = Yellow = Alumel (non-magnetic)
(-) = Red = Chromel (magnetic)



Delta Wiring Configuration



Wye Wiring Configuration

Contact Information

For Orders and Product Information

TUTCO HEATING SOLUTIONS GROUP | SureHeat

22 Industrial Drive
Exeter, NH 03833

Direct: +1.603.418.7662
Toll-Free: +1.800.258.8290

Support Email: support@tutcosureheat.com

Limited Liability Warranty

Tutco SureHeat warrants that all products to be delivered hereunder will be free from defects in material and workmanship at the time of delivery. Tutco SureHeat's obligation under this warranty shall be limited to (at its option) repairing, replacing, or granting a credit at the prices invoiced at the time of shipment for any of said products. This warranty shall not apply to any such products which shall have been repaired or altered, except by Tutco SureHeat.

Tutco SureHeat shall be liable under this warranty only if (A) Tutco SureHeat receives notice of the alleged defect within sixty (60) days after the date of shipment; (B) the adjustment procedure hereinafter provided is followed, and (C) such products are, to Tutco SureHeat's satisfaction, determined to be defective.

THE WARRANTY SET FORTH IN THE PRECEDING PARAGRAPH IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY.

The information contained in this manual is based on data considered to be true and accurate. Reasonable precautions for accuracy has been taken in the preparation of this manual, however Tutco SureHeat assumes no responsibility for any omissions or errors, nor assumes any liability for damages that may result from the use of the product in accordance with the information contained in this manual.

Please direct all warranty/repair requests or inquiries to the place of purchase, and provide the following information, in writing:

(A) Order number under which products were shipped
(B) Model/Serial Number of product
(C) Reason for rejection

Products can not be returned to Tutco SureHeat without authorization. Replacement, repair, or credit for products found to be defective will be made by the place of purchase. All products found to be not defective will be returned to the buyer; transportation charges collect or stored at buyers expense.

Worldwide Locations

Tutco Heating Solutions Group
North American Headquarters
500 Gould Drive
Cookeville, TN 38506
www.tutco.com

Tutco SureHeat
22 Industrial Drive
Exeter, NH 03833
www.tutcosureheat.com

Your Tutco SureHeat Distributor:

Distribution Locations:

Albania
Austria
Australia
Belarus
Belgium
Bosnia
Canada
China
Chile
Croatia
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Hungary
Hong Kong
India
Indonesia
Italy
Japan
Kenya
Korea
Latvia
Lithuania
Luxembourg
Mexico
Moldova
Netherlands
Norway
North Africa
Philippines
Poland
Portugal
Romania
Russia
Saudi Arabia
Shanghai
Singapore
Slovak Republic
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Spain
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